INEEL/EXT-01-00016
Revision 0

Operations and Maintenance Plan for Operable Unit 7-08, Organic Contamination in the Vadose Zone

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Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC

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ABSTRACT

A remedy for organic contamination in the vadose zone (OCVZ) is being implemented for this operations and maintenance (O&M) plan in accordance with the Operable Unit 7-08 Record of Decision (ROD). According to the ROD, the selected remedial action for OCVZ consists of (1) extracting and destroying organic contaminant vapors present in the vadose zone beneath and within the immediate vicinity of the Radioactive Waste Management Complex, and (2) monitoring vadose zone vapors.

The activities and procedures for safe and compliant operation and maintenance of vapor vacuum extraction with treatment units, and the associated monitoring and extraction wells to implement the remedial action are described in this O&M Plan.

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ACRONYMS

ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DOE	U.S. Department of Energy
DRE	destruction and removal efficiency
EDF	Engineering Design File
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
FTIRS	fourier transform infrared spectrometers
HWD	hazardous waste determination
INEEL	Idaho National Engineering and Environmental Laboratory
ISMS	Integrated Safety Management System
MCP	management control procedure
O&M	operations and maintenance
OCVZ	organic contamination in the vadose zone
OU	operable unit
PE	project engineer
PLC	programmable logic controller
PM	project manager
POC	point of contact
POD	plan of the day
PPE	personal protective equipment
RA	remedial action
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RRWAC	INEEL reusable property, recyclable materials, and waste acceptance criteria

RWMC	Radioactive Waste Management Complex
SCADA	Supervisory Control and Data Acquisition
SDA	Subsurface Disposal Area
SRPA	Snake River Plain Aquifer
VOC	volatile organic compound
VVET	vapor vacuum extraction with treatment
WAG	waste area group
WGS	Waste Generator Services

Operations and Maintenance Plan for Operable Unit 7-08, Organic Contamination in the Vadose Zone

1. INTRODUCTION

1.1 Purpose

The purpose of this Operations and Maintenance (O&M) Plan for Operable Unit (OU) 7-08 is to provide a remedy for organic contamination in the vadose zone (OCVZ) within the Subsurface Disposal Area (SDA) of the Radioactive Waste Management Complex (RWMC). In addition, the selected remedy will include monitoring of vadose zone vapor and the Snake River Plain Aquifer (SRPA). The OCVZ remedial action (RA) is being implemented in accordance with the OU 7-08 Record of Decision (ROD) (DOE-ID 1994). According to the ROD, the selected remedy consists of (1) extraction and destruction of organic contaminant vapors present in the vadose zone beneath and within the immediate vicinity of the SDA, and (2) monitoring of vadose zone vapors.

This O&M plan is a revision to include modification of a pre-existing system. The system previously included the following three Thermatrix thermal oxidation systems: Unit A, Unit B, and Unit C with capacities of 400 standard cubic feet per minute (scfm), 400 scfm, and 200 scfm, respectively. Most recently, each oxidizer was connected to one extraction well from which contaminant vapors were withdrawn. Units A and B were most recently and are currently connected to Wells 8901D and 2E, respectively. Unit C was connected to Well 7V prior to decommissioning and demolition. The King, Buck Technology catalytic oxidation system (Unit D) has been installed at the Unit C site using the Unit C skid and the modified Unit C enclosure. Unit D is currently connected to Well 7V.

The activities and procedures for safe and compliant operation and maintenance of vapor vacuum extraction with treatment (VVET) units and the associated monitoring and extraction wells to implement the RA are described in this O&M plan.

This plan includes requirements and procedures associated with the following:

- VVET Unit A (Thermatrix 400-scfm propane fired thermal oxidizer)
- VVET Unit B (Thermatrix 400-scfm propane fired thermal oxidizer)
- VVET Unit D (a 500-scfm electrically heated catalytic oxidizer manufactured by King, Buck Technology).

1.2 Scope

Regulatory guidelines and reporting requirements for safe and compliant operation of the VVET system are outlined in this plan. The operation of the VVET units complies with all required U.S. Department of Energy (DOE) orders and federal, state, and local regulations for compliance with environmental release criteria, monitoring, and reporting. This plan applies to normal operation and maintenance of the VVET units. The plan identifies the wells used by the project for monitoring and extracting vapors. As new or different types of units are purchased and installed, revisions to this plan will be necessary. Contaminant monitoring of the SRPA is beyond the scope of this O&M plan and has been completed by OU 7-13/14.

2. DESCRIPTION OF VVET OPERATIONS

To implement the selected remedy described in the OU 7-08 ROD, two types of oxidation systems (i.e., thermal and catalytic) are employed at the SDA. The function of each unit is essentially the same. A vacuum blower draws air containing volatile organic compounds (VOCs) from subsurface extraction wells into a heated reactor where spontaneous reaction with air in the presence of a reactive solid surface occurs. The primary products of oxidation are carbon dioxide (CO_2) and hydrochloric acid (HCl). Exhaust gases are expelled through a stack and dispersed into the atmosphere.

Operation of the VVET units includes uptime, planned downtime, and unplanned downtime. Uptime is defined as the period of operation when the VVET units are running and drawing vapor from the extraction well. Planned downtime includes periods of operation when the units are shut down for planned maintenance, planned power outages, or rebound periods. Unplanned downtime includes shutdown of a unit resulting from unplanned power outages, component failure, or operation outside of design parameters.

The goal of this plan is to minimize unplanned downtime during the VVET operations phase of the RA. This will be accomplished through implementation of a preventive maintenance and instrument calibration schedule. This schedule will serve to detect component deficiencies early and minimize the failures that result in shutdown.

A project team has been assembled to draw on the expertise of each engineering discipline (i.e., electrical, mechanical, and chemical). A team of qualified technicians is permanently stationed at the RWMC to start up and shut down the oxidizers, facilitate preventative maintenance activities, and monitor operations. A dedicated system engineer is assigned to the OCVZ project to monitor specific trends of the units (e.g., operating temperature/pressure, system flowrate, and propane usage), troubleshoot, and identify and locate problems before they cause ultimate failure. The components of this program help to ensure operating time for the units is maximized. The semiannual data report provides a forum for discussion of "lessons learned" during the proceeding months of operation. Review and discussion of "lessons learned" satisfies required proficiency training for maintenance of operating technician qualifications.

As stated, planned downtime includes rebound periods that are conducted at selected sample locations to maximize VOC mass removal. The number and length of the short-term rebound periods will be determined by the project as the VVET operations database is established. The intent of the rebound period is to allow subsurface concentrations to equilibrate so that the progress of the remedial effort can be assessed. If vapor emissions and trends across the short-term rebound periods meet specified statistical criteria, the project will enter into a long-term rebound period referred to as the quiescent "compliance verification period" (INEEL 2000a) to verify that vapor emissions remain within acceptable limits under natural pressure conditions within the vadose zone. If vapor emissions and trends during the compliance verification period meet specified statistical criteria, the project will enter into the long-term monitoring phase. During the long-term monitoring phase, sampling frequencies will be reduced and the VVET units will be mothballed, based on the understanding that restart of the VVET units is not imminent.

Level D personal protective equipment (PPE) is required to access any of the VVET units. This includes, at a minimum, a hard hat, safety glasses, and steel toe shoes. Additional PPE includes cold weather gear to minimize the hazards of exposure, to be used as necessary. Further details of required PPE, field communications procedures, and emergency response activities are identified in the OCVZ Health and Safety Plan (Miller 2001).

2.1 System and Equipment Description

The process can be divided into the following three basic operations: pretreatment, thermal oxidation, and stack release of the oxidizer exhaust gas. The functions of each operation are discussed in the sections below. The thermal oxidizer and catalytic oxidizer piping and instrumentation diagrams are included in Appendix A.

2.1.1 Pretreatment

The pretreatment equipment collects extracted VOC vapor into a header using a vacuum blower. The VOC vapor is withdrawn from the well head and carried to the skid through insulated piping. Supplemental heat is provided to the flowing vapor to minimize condensation of vapors in the transfer lines. Each manifold is configured to accept feed from multiple well locations. The fraction of feed withdrawn from any given well is controlled through the adjustment of hand control valves on the respective well lines. Vapor flow rate from each extraction well is measured upstream of the manifold connection.

Total vapor pressure, temperature, and flow are monitored and controlled in the main vapor header upstream of the oxidizer.

2.1.2 Oxidation

The two different oxidation systems that will be used to treat VOCs include thermal and catalytic oxidizers. Though different in configuration, both types of oxidation systems employ a similar mechanism to enact the contaminant destruction. In both cases, the vapor temperature is elevated by an external source to the set point temperature of the process. The oxidation occurs spontaneously as the high-temperature vapor is conducted across a solid surface. Heat is recovered from the treated vapor exiting the oxidizer. In both processes, the primary reaction product is HCl.

2.1.2.1 Thermal Oxidizers. Thermal oxidizers employ injected propane as the heat source for the oxidation reaction. Propane is injected into the flowing vapor through a sparger and directed through a static mixer into the inlet plenum of the oxidation vessel. The inlet plenum is separated from the rest of the oxidizer by a tube sheet perforated with 20 tubes. The vessel is configured for shell and tube counter-current flow where the inlet mixture enters the bottom of the vessel and travels upward through the packed tubes, while reacted materials travel downward through the packed shell toward the exit. Heat is recovered from the exhaust gases into the inlet flow through the walls of the feed tubes. The vessel (i.e., shell and tubes) is packed with high-heat-capacity ceramic balls and saddles above the tube sheet. These balls and saddles provide for complete mixing of the flow, act as a heat sink, and provide an active surface that sustains the oxidation reaction at approximately 1,800°F. Detailed component-level information, including system design criteria, are collected in vendor data as part of the OCVZ remedial design/remedial action work plan (Scientech 1995). Thermal oxidizer specifications are shown in Table 1.

2.1.2.2 Catalytic Oxidizers. Vapor flow entering the catalytic oxidizer is directed through a vapor liquid separator to remove any free-phase liquids that may be entrained in the vapor flow. If the vapor flow is excessively dry, additional deionized water may be added through a sparger to ensure complete saturation. The flow is then directed into the shell side of a shell and tube heat exchanger where heat is recovered from exhaust gases into the inlet flow. Exiting the heat exchanger, the inlet flow is conducted past an electric bayonet style heater where the temperature is elevated to the set point temperature of the catalytic process, nominally 900°F. Oxidation of chlorinated hydrocarbons occurs spontaneously over the catalytic surface using water as the hydrogen source for the reaction. Detailed component level information, including system design criteria, is recorded in the Idaho National Engineering and Environmental Laboratory (INEEL) Configuration Management System Component Equipment List.

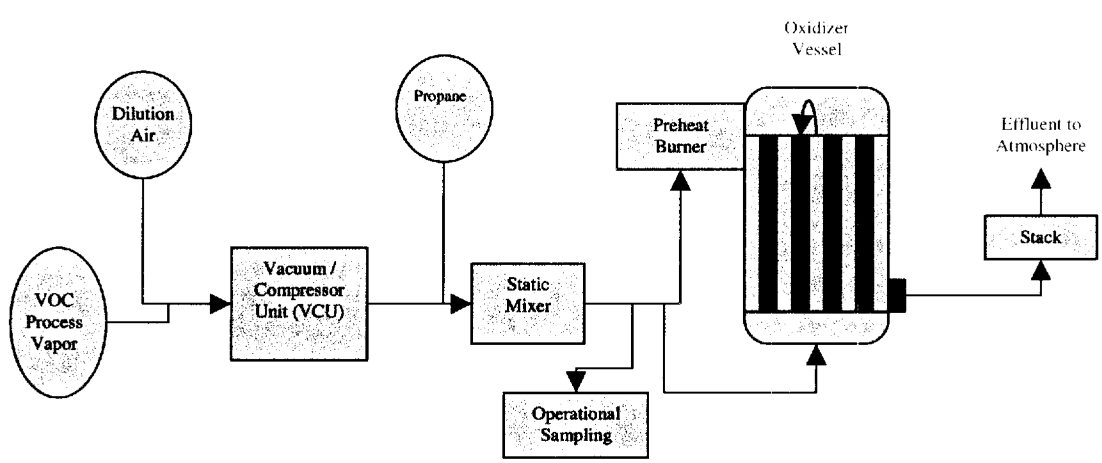
Table 1. Thermal oxidizer specifications.

Nominal Capacity	400 scfm
Daily Destruction Rate of Cl-VOC	242.4 lb/day (max)
Equivalent Concentration	1100 ppmv mixed Cl-VOC
Dimensions	32-ft length × 10-ft width
Electric Requirements:	
VCU Motor	40 hp, 460V, 3∅

2.1.2.3 Exhaust. Oxidation products are exhausted from the system through a 30-ft stack. The destruction and removal efficiencies (DRE) for the catalytic and thermal oxidation systems are 0.9999 and approximately 0.983, respectively. While composed primarily of excess air, water, and oxidation products, trace quantities of unreacted VOCs such as carbon tetrachloride (CCl_4), trichloroethene (TCE), tetrachloroethylene (PCE), and 1,1,1-trichloroethane (TCA) are expelled from the stack with the product gasses. The primary oxidation products are HCl and CO_2, with a lesser quantity of chlorine gas (Cl_2). In both types of oxidation systems, the presence of water works to minimize the production of Cl_2. The stack temperature for the catalytic system is approximately 500°F, while that of the thermal systems is typically 750°F.

2.2 Startup Sequence

2.2.1.1 Thermal Oxidizers. Startup of the thermal oxidation systems begins with an inspection to verify valve positions and resolve any conditions that may have resulted in a prior shutdown. With the inspection complete, the blower is started and purging of the oxidation vessel with ambient air is commenced. After purging, propane flow to the preheater pilot is initiated and the pilot is ignited. Propane flow to the preheat burner is subsequently enabled and the oxidizer bed is heated until the ceramic matrix is above 1,600°F. Propane flow to the burner is then stopped and feed to the oxidizer inlet plenum is initiated. After establishment of the temperature profile in the upper section of the oxidizer vessel reaches 1,800°F, the extraction well valve is opened and vapor oxidation is commenced. A block diagram for the thermal oxidizers is illustrated in Figure 1.



2.2.1.2 *Catalytic Oxidizer.* Startup of the catalytic oxidation system begins with an inspection to verify valve positions and resolve any conditions that may have resulted in a prior shutdown. After inspection, the blower is started, feeding ambient air into the oxidation system. The system heater is enabled and temperature is raised to 900°F over approximately 2 hours of preheating. With the catalyst at its normal operating temperature, the extraction well valve is opened and vapor oxidation is commenced. Figure 2 illustrates the major equipment associated with the catalytic oxidation system. Catalytic oxider specifications are shown in Table 2.

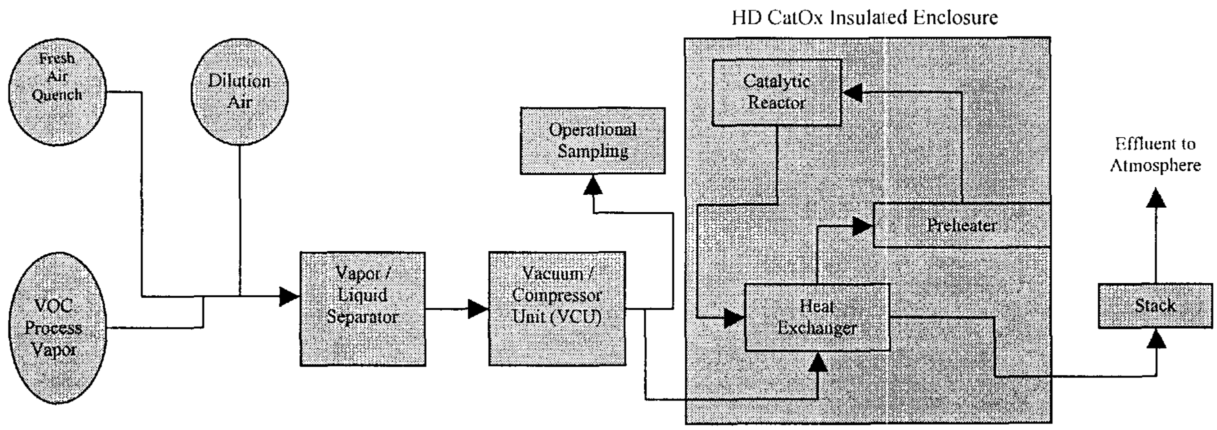


Figure 2. Block diagram of catalytic oxidation system.

Table 2. Catalytic oxidizer specifications.

Nominal Capacity	500 scfm
Daily destruction rate of Cl-VOC	415.2 lb/day (max)
Equivalent concentration	1500 ppmv mixed Cl-VOC
Dimensions	1 skid, 0-ft to 10-in. length × 8-ft to 6-in. width
Weight	6100 lb (approx.)
Electric requirements:	
VCU motor	25 hp, 460V, 3Ø
Pre-Heater	62 kW, 460V, 3Ø
Heat exchanger efficiency	60% Thermally efficient

2.3 Emergency Shutdown

Each of the oxidation systems is equipped with a programmable logic controller (PLC), which will automatically shut the unit down in the event that an unexpected or potentially unsafe condition arises. Amber and red strobes are located outside of each enclosure. The amber beacon is illuminated in the event of a warning alarm, alerting the operator of a condition that will result in system shutdown if left unresolved. The red beacon is illuminated after the PLC has entered a shutdown mode. The beacons are monitored by the operator during normal work hours (Monday through Thursday, 7:00 A.M. – 5:30 P.M.). Outside of normal hours, beacons are monitored by the RWMC Shift Supervisor during fire watch operations at 1-hour intervals. In the event of system shutdown outside of normal work hours, the responsible project manager (PM) is notified.

2.3.1 Thermal Oxidizers

Thermal oxidation system warning alarms are detailed in TPR-1628, "VVET Unit Startup, Operations, and Shutdown," Section 4.6, Table 3 of Appendix B. Shutdown alarms are detailed in TPR-1628, Section 4.7, Table 3 of Appendix B.

2.3.2 Catalytic Oxidizer

Catalytic oxidation system warning alarms are detailed in TPR-1662, "VVET Catalytic Oxidizer Startup, Operations, and Shutdown," Section 4.2.3.1, Table 1 of Appendix B. Shutdown alarms are detailed in TPR-1662, Section 4.2.3.2, Table 2 of Appendix B.

2.4 Freeze Protection

Freeze protection is afforded to each of the oxidizers via steel enclosures. Temperature sensitive components are housed within the heated structures to minimize exposure to cold temperatures. In a similar manner, electronics, including the PLCs, are housed within climate controlled enclosures. Flex couplings are installed on each pipe run to minimize the stress caused by frost heave.

2.5 Operations Waste

Generation of waste materials requiring hazardous material handling and disposal is not anticipated. A waste disposition and disposal form has been developed through Waste Generator Services (WGS) to handle any liquid hazardous wastes (e.g., vapor condensate) that may accumulate during system operation. Other waste streams, including various system filters, belts, and oils, are dispositioned and disposed of through WGS, as necessary. All materials are surveyed by Radiation Control technicians (prior to removal from the SDA) to verify that no radioactive contamination is present.

2.5.1 Waste Management

The waste streams that result from OCVZ operations are appropriately managed as Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) waste generated in support of implementing the OU 7-08 ROD. This section describes the waste streams to be generated and the important management considerations associated with generation, storage, and disposition of the waste streams, including waste minimization considerations. As indicated below, the nature of the VVET operations results in only limited waste generation primarily consisting of solid, industrial waste.

All waste streams generated from OCVZ operations will be managed under the direction OCVZ project personnel in close coordination with the WGS organization. Waste streams generated will be managed in accordance with the applicable or relevant and appropriate requirements (ARARs) documented in the OCVZ ROD, and the requirements and processes defined in the applicable INEEL management control procedures (MCPs). In particular, INEEL Companywide Manual 17, *Waste Management* will be followed, in addition to other applicable internal documents such as the *INEEL Reusable Property, Recyclable Materials and Waste Acceptance Criteria (RRWAC)* (DOE-ID 2000a). As required by the ROD and internal procedures, completion of a hazardous waste determination (HWD) is key to the initial management of all waste streams.

2.5.2 Waste Characterization and Management

Operation and maintenance of the various OCVZ systems results in the generation of a limited number of waste streams. The primary materials generated are solid waste items classified as industrial or conditional industrial waste under the RRWAC. Examples of these waste streams include tedlar bags and air filters.

The compressor systems used by Units A and B produce a very small volume of liquid condensate. The waste stream is to be characterized, after which appropriate disposal measures will be determined. Until such time as a hazardous waste determination is complete and disposal requirements can be identified, the condensate will be immobilized on vermiculite and stored as a hazardous waste.

It is noted that the SDA itself does contain waste streams that may potentially be associated with Resource Conservation and Recovery Act (RCRA) listed hazardous waste numbers. However, the uncontained gases (i.e., vadose zone vapors) processed by the VVET units are not solid waste by definition and are therefore not associated with listed waste codes.

In the event equipment leaks or chemical spills occur, the spilled materials (along with visibly contaminated soils) will be containerized, subjected to a complete hazardous waste determination, and dispositioned as waste in accordance with INEEL procedures. Generally, routine spills will be cleaned up at the time they occur, but not longer than 24 hours, as allowed by normal operational conditions (i.e., absent emergency conditions). All spills, regardless of amount, require notification of the spill notification team in accordance with applicable MCPs.

The waste resulting from these operations may require interim storage before transfer for disposal. Because there is a small potential that some waste streams will be associated with RCRA management considerations, the waste may be stored in containers pending return of analytical data and completion of the HWD. A waste storage area for managing CERCLA waste has been established by WGS personnel to ensure appropriate management of residual materials pending completion of the HWD and shipment for disposal.

Packaging will be in compliance with the RRWAC, RCRA regulations found in 40 CFR 264 Subpart I, and U.S. Department of Transportation regulations (49 CFR 171, 173, 177 and 178). The assigned WGS personnel, along with Packaging and Transportation organizations, should be consulted prior to waste generation to identify specific types of containers to be used for the anticipated waste. Appropriate containers for waste include 208-L (55-gal) drums and other suitable containers that meet the Department of Transportation regulations on packaging (49 CFR 171, 173, 178 and 179). All waste containers will be labeled appropriately.

Records and reports related to waste management are required to be maintained as indicated by MCP-3475, "Temporary Storage of CERCLA-Generated Waste at the INEEL." Some of these may be completed by others, but must be available either at the RWMC or with the OCVZ or Waste Area Group (WAG) 7 project files. These records shall include, but not be limited to, the following:

- Hazardous waste determinations, characterization information, and statements of process knowledge

- CERCLA Storage Area inspection reports and log-in, log-out history
- Training records
- Documentation with respect to all spills.

2.5.3 Waste Segregation

Construction waste streams will generally not be hazardous waste, but rather will be industrial waste and will not typically require RCRA or Toxic Substances Control Act compliant storage. Some industrial waste generated during construction (e.g., office waste and lunch trash) can be disposed in cold waste receptacles.

Container storage areas and containers for collection of waste will be clearly labeled to identify waste type. Waste will generally be segregated according to waste category (e.g., hazardous classification) and type (i.e., solid, liquid, soil, and sludge). Segregation by waste category primarily entails designation of separate areas within the CERCLA storage facility. This segregation entails separation of mixed waste, low-level waste, and hazardous, solid, and liquid waste streams within containers and within the storage facility. Waste segregation may be an iterative process such that initial classifications of waste may change after receipt of analytical results. Finally, segregation of waste materials to address issues related to incompatible chemicals and/or properties such as flammability will also occur.

2.5.4 Waste Minimization and Pollution Prevention

The OU 7-08 O&M activities are conducted in accordance with the *U.S. Department of Energy, Idaho Operations Office Idaho National Engineering and Environmental Laboratory Interim Pollution Prevention Plan* (DOE-ID 2000b). The plan specifies pollution prevention (P2) and waste minimization (Wmin) program activities and methods that will be employed to reduce the quantity and toxicity of waste generated at the INEEL. Various general P2 program information relating to Wmin and P2 (e.g., waste tracking and employee incentive programs) can be referenced in the plan.

The following project specific activities will ensure that minimal quantities of waste are generated or that hazardous waste generation is avoided.

- PPE usage will be minimized by reusing and laundering items to the extent possible
- Controls on materials accepted for use and controls on disposal will be implemented (as appropriate) to ensure minimal waste generation
- Maintenance of equipment is required to prevent undesirable conditions such as leaking hoses and fittings
- Disposition of industrial waste will be minimized by discussing conservation measures with operational staff during daily briefings
- Any potential hazardous waste will be systematically segregated from industrial or sanitary waste streams
- Collecting all samples necessary at one time, such that additional waste is not generated from resampling.

The INEEL project managers (PMs) assigned to each remediation project have specific responsibility for implementing Wmin requirements for that project. The Wmin and P2 requirements, as implemented in MCPs, are required reading for all PMs. Project personnel are required to read and understand the pertinent portions of project plans relating to waste minimization and pollution prevention (e.g., health and safety plans and test plans) with respect to their functions prior to performing the tasks.

With certification of the Integrated Safety Management System (ISMS), P2 becomes an integral part of planning, operations, and work activities at all INEEL facilities. Pollution prevention goals and training programs have been implemented into ISMS documentation, including various INEEL program description and requirements documents and MCPs.

3. DOCUMENTATION

Procedures, operator logbooks, and round sheets have been developed to direct and record all phases of operation for both types of oxidation systems. These phases include startup, shutdown, normal operation, and operability testing. The following section identifies and describes the various procedures applicable to operation and testing of the oxidation systems. Copies of the procedures, log sheets, and round sheets are provided in Appendix B.

Drawings are updated and maintained in accordance with MCP-2377, "Development, Assessment, and Maintenance of Drawings," and MCP-3534, "Use of Registered Professional Engineers." The drawings are available within the INEEL Electronic Data Management System. System drawings, including piping and instrumentation diagrams, are included in Appendix A.

3.1 Pre-Job Briefings

Pre-job briefings are conducted per MCP-3003, "Performing Pre-Job Briefings and Post-Job Reviews," and documented on Form 434.14. Individual pre-job briefings are conducted and documented prior to maintenance activities, system repairs, modifications, and execution of procedures. Executed pre-job briefing forms are maintained as work control documentation with the associated work package.

3.2 Material Safety Data Sheets

Material safety data sheets for any chemicals used on the project can be accessed from the Site Project Office, WMF-657. A list of chemicals used or stored at the job site is available at the site project office and through the INEEL Chemical Management System.

3.3 Thermal Oxidizers

According to the informal performance testing completed by Scientech on Units A, B, and C in 1996, following startup, Units A and B had an average DRE of approximately 98.3%. The results were documented in an update to the Work Plan (Scientech 1995) as Attachment D.

3.3.1 VVET Unit Startup, Operations, and Shutdown

Technical Procedure (TPR)-1628, "VVET Unit Startup, Operations, and Shutdown" (see Appendix B), directs the startup, routine operations, response to alarms, and shutdown of the VVET thermal oxidation units, which are designated Units A and B. The startup addresses all subsystems, including electrical power, compressed air, and propane, and outlines conditions of flow, pressure, and temperature appropriate for system operation. Both non-emergency and emergency situations are covered under shutdown. This procedure does not address sampling activities. Extracted vapor is routinely sampled for volatile organic contaminants in accordance with TPR-1631, "VVET Unit Operational Sampling" (see Appendix B). This procedure addresses operational activities to be performed by a qualified VVET technician.

3.3.2 VVET Unit Operational Sampling

Technical Procedure (TPR)-1631, "VVET Unit Operational Sampling" (see Appendix B), directs the routine operational sampling of the influent vapor and air mixture at the inlet to the VVET thermal oxidizers. The procedure covers daily collection of samples, transportation of the samples to the Central Facilities Area laboratory, and notation of sampling actions in the VVET unit narrative log. Samples are collected daily Monday through Thursday and analyzed using a B&K multi-gas photo-acoustic analyzer.

3.3.3 System Operability Test Procedure

Qualification Test Procedure (QTP)-022, "VVET Unit System Operations Test" (see Appendix B) is designed to provide detailed step-by-step instructions to test the operability of the system. The primary focus of this procedure is testing the process control system and safety interlocks to ensure that they are functioning properly. This procedure is used only when significant modification, maintenance, or repair has been completed, or when the system has been out of service for an extended period of time.

3.3.4 Log Books and Round Sheets

The operator logs are for recording data from process instruments not monitored through the Supervisory Control and Data Acquisition (SCADA) system. The instruments include various pressure and flow indicators located throughout the system.

Round sheets are used to lead the operator through a daily inspection of the VVET units. The examination is performed to ensure that all systems are functioning properly. Round sheet activities include checking compressor oil level and pressure, verifying proper cycling of the air dryer, draining water from the compressor tank, and making other component checks.

3.4 Catalytic Oxidizers

The results of the performance test on Unit D are documented in *Operable Unit 7-08 Catalytic Oxidizer Performance Test Report* (Soelberg et al. 2001). Unit D test results indicate a DRE of approximately 99.99%.

3.4.1 VVET Catalytic Oxidizer Startup, Operations, and Shutdown

Technical Procedure (TPR)-1662, "VVET Catalytic Oxidizer Startup, Operations, and Shutdown" (see Appendix B), provides specific instructions for startup and operation of the catalytic units, directs the prerun inspection, and outlines conditions of flow, pressure, and temperature appropriate for system operation. This procedure addresses operational activities to be performed by a qualified VVET technician.

3.4.2 VVET Unit Operational Sampling

Technical Procedure (TPR)-1662, "VVET Catalytic Oxidizer Startup, Operations, and Shutdown" (see Appendix B), directs the routine operational sampling of the influent vapor and air mixture from the inlet to the VVET catalytic oxidizers. The procedure covers daily collection of samples, transportation of the samples to the Central Facilities Area laboratory, and notation of sampling actions in the VVET unit narrative log. Samples are collected daily (i.e., Monday through Thursday) and analyzed using a B&K multi-gas photo-acoustic analyzer.

3.4.3 VVET Catalytic Unit Integrated Test

Technical Procedure (TPR)-1764, "VVET Catalytic Unit Integrated Test" (see Appendix B), directs testing to ensure the overall performance of the VVET catalytic unit. The procedure provides step-by-step directions for a qualified VVET technician to perform integrated testing on the main system functions, the alarm system, and the SCADA system. Shop testing and performance testing were conducted on the VVET Unit D catalytic system prior to shipment to the INEEL.

In addition, TPR-1764 or an equivalent test procedure will be performed after any extended shutdown, subsequent to system repairs, or as determined necessary by the system engineer or PM. The procedure may be performed in part or in its entirety at the discretion of the system engineer.

A catalytic oxidizer performance test was conducted according to the test plan (Soelberg 2000). This performance test was an acceptance test for the VVET Unit D catalytic oxidizer. The test provided data for the following emissions modeling test objectives:

- Determine the CCl_4 destruction and removal efficiency
- Determine emissions of HCl and Cl_2 resulting from operation of Unit D
- Determine any measurable amounts of VOC products of incomplete destruction.

The results of the performance test demonstrated that CCl_4 destruction and removal efficiency ranged between 99.997% and 99.999%. The results were calculated from the gravimetric flow rate of feed CCl_4, and CCl_4 emissions measured by Environmental Protection Agency (EPA) Method 0031 (Soelberg 2000).

System operability testing was performed at the manufacturer's shop to ensure that individual components function as designed and according to the project technical specification.

3.4.4 Log Books and Round Sheets

The operator logs are for recording data from process instruments not monitored through the SCADA system. The instruments include various pressure, temperature, and flow indicators located throughout the system. The operator logs are kept either at the VVET units or in the Site Project Office. Completed logbooks are retained in environmental restoration (ER) document control and are scanned into the Optical Imaging System providing access to archived operations data.

Round sheets are used to lead the operator through a daily inspection of the VVET units. The examination is performed to ensure that all systems are functioning properly. Daily mechanical inspections are conducted pursuant to RWMC Round Sheets (RS) Manual RS-045 for the catalytic oxidizer and RS-041 for the thermal oxidation systems. Roundsheets are checked out, completed, and returned to RWMC document control for storage on a daily basis Monday through Thursday. Examples of roundsheets for each type of unit are attached in Appendix B.

4. SYSTEM MAINTENANCE

Maintenance instructions and procedures, along with a thorough check of all operating conditions, have been developed and implemented to ensure the proper operation of the thermal and catalytic oxidizers. A scheduled maintenance program has been developed to minimize operational problems such as equipment failure. Various maintenance activities, including instrument calibration, are completed at various monthly, quarterly, semiannual, and annual intervals, as recommended by manufacturer specifications.

4.1 Thermal Oxidizers

4.1.1 Preventive Maintenance

Preventive maintenance activities are completed to maximize operational uptime of the oxidation system. Maintenance activities completed on VVET Units A and B are listed in Table 3 with their respective intervals.

The VVET technician shall check the propane system to ensure all associated equipment is in good working order and that valves are in the proper configuration. After significant repairs or modifications, the VVET technician shall ensure that all guarding equipment and electrical covers are in place and properly secure before system testing.

Table 3. Preventive maintenance activities for thermal oxidizers.

Equipment Tag	Description	Activity	Interval
BLO-210	Blower	Lubricate bearings on drive end.	Monthly
BLO-210	Blower	Change inlet filter.	Semiannual
COM-910	Compressor	Change oil and filter.	Semiannual
COM-910	Compressor	Check tightness of pulley.	Semiannual
COM-910	Compressor	Grease motor bearings.	Semiannual
COM-910	Compressor	Clean or replace air intake filter.	Semiannual
BLO-210	Blower	Change gearbox oil.	Semiannual
BLO-210	Blower	Check and adjust belt tension.	Semiannual
DRY-110	Air dryer	Clean or replace the control air filter.	Semiannual
DRY-110	Air dryer	Inspect and replace purge muffler as necessary.	Semiannual
COM-910	Compressor	Inspect pressure diaphragm and contacts.	Annual
COM-910	Compressor	Inspect motor starter contacts.	Annual
COM-910	Compressor	Circulate corrosion inhibitor through heat exchanger unit strainer.	Annual
COM-910	Compressor	Clean cooling surfaces of intercooler and compressor	Annual

4.1.2 Calibration

Instrument calibrations are completed at regular intervals to maximize the quality of operations data and the confidence with which this data can be applied to make judgments relative to process performance. Instruments, including pressure gauges, pressure transducers, flow transmitters, and thermocouples, are calibrated according to the intervals in Table 4. Instruments not requiring calibration are listed in Table 5.

Table 4. Calibration intervals for pressure and flow instruments.

Equipment Tag	Instrument Type	Description	Interval
FT-210	Flow meter	Vapor flow meter	Semiannual
PI-100B	Pressure indicator	Wellhead pressure	Annual
PI-200A	Pressure indicator	Makeup air intake pressure	Annual
PI-220B	Pressure indicator	Propane feed pressure	Annual
PI-221	Pressure indicator	Propane burner pressure	Annual
PI-222	Pressure indicator	Oxidizer vessel propane feed pressure	Annual
PI-223	Pressure indicator	Burner pilot pressure	Annual
PI-230	Pressure indicator	Burner air pressure	Annual
PT-100	Pressure transducer	Wellhead pressure transducer	Annual
PT-210	Pressure transducer	Blower outlet pressure	Annual

Table 5. Instrumentation not requiring calibration.

Equipment Tag	Instrument Type	Description	Justification
TE-340 TE-341a-n TE-342	Thermocouple Thermocouple Thermocouple	Type K thermocouple Type K thermocouple Type K thermocouple	Temperature elements are easily damaged and often fail resulting from handling during calibration. Each element is calibrated when new and replaced after 10,000 hours of operation.
TI-340 TI-341a-n TI-342	Temperature Indicator Temperature Indicator Temperature Indicator	Eurotherm 808 temperature indicating controller	Calibration not required in this application
FE-220 FI-220 FT-220	Propane Flowmeter	Propane feed flowmeter, indicator, and analog signal transmitter	Calibration not required in this application.
ZSH / ZSL	Position Switches	Full open / full closed valve position switches	Calibration not required in this application.
PSH,PSHH / PSL,PSLL	Pressure Switches	High / low pressure switches	Calibration not required in this application.

4.1.3 Spare Parts List

Spare parts are ordered and maintained in storage at the RWMC. Spare parts for the thermal oxidizer are listed in Table 6. The master equipment list, including part descriptions, is available as a vendor data submittal from Thermatrix as a separate document.

Table 6. Spare parts.

Tag No.	Part No.	Description	Manufacturer
FT-210	8831	Flow Meter	Eldridge
BX-210	5VX-900	Blower Belt	Sutorbilt
D-100	F8-134	Filter Element	Sutorbilt
SX-210	81-0475	Silencer Filter Element	Universal Silencer
TE-341 A-L	1K1BMU639/16ZZ&	Thermocouple Element	JMS
XV-223; XV-911	D290DBW	Solenoid Valve	Granzow
PI-100A/B; PI-210A: PI-910A/B	45 1279SS04L	Pressure Indicator	Ashcroft
PI-221/2/3; PI-230	45 118SS04L	Pressure Indicator	Ashcroft
PT-100/210	90DP3-211243212A2	Wellhead Pressure Transducer	Weed Process Instrumentation
BE/BSLL-330	C7027-1049	Flame Scanner and Relay	Honeywell
None	110377F100	Compressor Filter Element	Quincy

4.2 Catalytic Oxidizers

4.2.1 Preventive Maintenance

Preventive maintenance activities are completed to maximize operational uptime of the oxidation system. Maintenance activities are detailed in Table 7 with their respective intervals.

Table 7. Preventive maintenance activities for catalytic oxidizers.

Equipment Tag	Description	Activity	Interval
BLO-101, MO-101	Blower/motor	Grease bearings, check for unusual vibration.	Monthly
F-101	Air filter	Inspect and brush off collected dust and debris.	Monthly
Enclosures	Control enclosures	Check door seal for proper alignment.	Monthly
MO-101, P-101	Induction motor	Ensure motor exterior is clean. Remove debris from cooling air intake. Drain accumulated moisture from bearing housing. Check for leaks around seals and gaskets. Check for normal discharge pressure of P-101.	Monthly
FE-101, FE-150	Flow Elements	Check probe for proper alignment. Ensure fittings are tight.	Monthly
PDT-101, PDT-150	Differential pressure transmitters	Ensure end covers are in place, connections are tight, and unit is clean. Drain liquid from bottom drain plugs.	Monthly
Enclosures	Control enclosure	Lubricate door seal with silicon lubricant.	Quarterly
BLO-101	Blower	Drain, flush, and replace gearbox oil. Use only straight mineral oil (aviation oil).	Quarterly
BLO-101	Blower	Check tightness of pulley; inspect drive belts.	Quarterly
PDI-XXX, PI-XXX	Pressure indicators	Vent to atmosphere and zero gauge.	Quarterly
FLT-101	Demister	Inspect and brush off collected dust and debris.	Semiannual
FE-101, FE-150	Flow elements	Remove probe and check for scale of contaminant buildup.	Semiannual
V-101, FCV-107, FCV-112	Valve actuator	Check for smooth, full range operation. Refill actuator with immersion oil, as necessary.	Semiannual
LSH-100, LSHH-100, LSL-100	Level switches	Check for proper switching and clean, as necessary.	Semiannual
PDT-101, PDT-150	Differential pressure transmitters	Inspect and lubricate O-rings with appropriate grease.	Semiannual
HE-300	Heat exchanger	Open shell and tube drain ports. Inspect for moisture buildup.	Annual
HTR-150, HTR-201	Immersion heaters	Check tightness and clean line connections, as necessary. Remove heater, check for scale, and clean, as necessary.	Annual
BLO-101	Blower	Change sealed bearings.	Biannual

4.2.2 Calibration

Instrument calibrations are completed at regular intervals to maximize the quality of operations data and the confidence with which this data can be applied to make judgments relative to process performance. Instruments, including pressure gauges, pressure transducers, flow transmitters, and thermocouples, are calibrated according to the intervals in Table 8. Instrumentation not requiring calibration is listed in Table 9.

Table 8. Calibration intervals for pressure and temperature instruments.

Instrument Tag Number	Instrument Description	Manufacturer	Instrument Calibration Range	Recommended Calibration Interval
PI-150	Wellhead pressure	Dwyer Instruments	0 to 100 in. H_2O Vac.	Semiannual
TI-101	Bimetal thermometer heat	Reo-Temp	0 to 250°F	Semiannual
TI-150	Well line temperature	Reo-Temp	0 to 250°F	Semiannual
FE-150	Differential pressure wellhead flow sensor	Dwyer Instruments	0 to 500 scfm	Semiannual
PDT-150	Differential pressure transmitter	Rosemount	0 to 10 in. H_2O	Semiannual
PDI-150	Differential pressure indicator	Dwyer Instruments	0 to 10 in. H_2O magnehelic	Semiannual
PI-101	Separator pressure	Dwyer Instruments	0 to 100 in. H_2O Vac.	Semiannual
PI-103	Transfer pump pressure	Winters	0 to 30 psig	Semiannual
PI-102	Blower outlet pressure	Dwyer Instruments	0 to 50 in. H_2O	Semiannual
PDT-101	Differential pressure transmitter	Rosemount	0 to 10 in. H_2O	Semiannual
PDI-101	Differential pressure indicator	Dwyer Instruments	0 to 10 in. H_2O magnehelic	Semiannual
FE-101	Differential pressure process flow sensor	Dwyer Instruments	0 to 500 scfm	Semiannual
TE-150A	Wellhead heater temperature	ThermX Southwest	Type K thermocouple	Annual
TE-150B	Wellhead heater temperature	ThermX Southwest	Type K thermocouple	Annual
TE-151	Well line temperature	ThermX Southwest	Type K thermocouple	Annual
TE-101	Exchanger inlet temperature	ThermX Southwest	Type K thermocouple	Annual
TE-301	Catalyst inlet temperature	ThermX Southwest	Type K thermocouple	Annual
TE-302A	Catalyst exit temperature	ThermX Southwest	Type K thermocouple	Annual
TE-302B	Catalyst exit temperature	ThermX Southwest	Type K thermocouple	Annual
TE 303	Exhaust temperature	ThermX Southwest	Type K thermocouple	Annual

Table 9. Instrumentation not requiring calibration.

Equipment Tag	Instrument Type	Description	Justification
TS-801, TS-850	Temperature switch	Redundant FM Approved high temperature limit device	Calibration not required because of redundancy of configuration. Switches are tested after extended shutdown.
LSL, LSH, LSHH-100	Low / High level switches	Level switches for monitoring of vapor / liquid separator liquid level.	Calibration not required in this application. Switches are tested after extended shutdown.

4.2.3 Spare Parts

Spare parts are ordered and maintained in storage at the RWMC. Spare parts for the catalytic oxidizer are listed in Table 10. The master equipment list, including part descriptions, is available as a vendor data submittal from King, Buck as a separate document.

Table 10. Recommended spare parts.

	ITEM#	Manufacturer	Part#	Description
VVED	GSK101	Windustrial	6" 150 lb 1/8"	6" PTFE Ring Gasket
VVED	GSK106			
VVED	GSK107			
VVED	GSK102	Windustrial	3" 150 lb 1/8"	3" PTFE Ring Gasket
VVED	GSK103	Windustrial	4" 150 lb 1/8"	4" PTFE Ring Gasket
VVED	GSK104			
VVED	GSK301			
VVED	GSK105	Windustrial	5" 150 lb 1/8"	5" PTFE Ring Gasket
VVED	F101	Solberg	235P	Filter Replacement (McMaster-Carr)
VVED	VLS	Grainger	1U928	View Port
VVED	QC101	Swagelok	SS-QC4-B-4PM	Quick Disconnect Sample Ports
VVED	FLT101	ACS	5CA	10" O.D. × 6" 304LSS Demister Pad
VVED	HTR201	Gortex	95665K38 (McMaster-Carr)	8" PTFE Ring Gasket
VVED	GSK302	Gortex	95665K33 (McMaster-Carr)	6" PTFE Ring Gasket
VVED	GSK302			

Table 10. (continued).

	ITEM#	Manufacturer	Part#	Description
VVED	CR801	Allen Bradley	700-HK36A1-4	SPDT Relay
VVED	CR802			
VVED	CR803			
VVED	CR805			
VVED	CR806			
VVED	CR809			
VVED	CR804	Allen Bradley	700-HK32A-4	DPDT Relay
VVED	CR807			
VVED	CR808			
VVED	LMP801	Allen Bradley	800T-Q10G	Green Pilot Light Assembly
VVED	LMP802			
VVED	LMP803			
VVED	LMP804			
VVED	LMP807			
VVED	LMP809			
VVED	LMP805	Allen Bradley	800T-Q10R	Red Pilot Light Assembly
VVED	LMP808			
VVED	LMP806	Allen Bradley	800T-Q10A	Amber Pilot Light Assembly
VVED	TS801	Watlow	146E-1603-3000	Hi-Limit Control
VVED	BLO101BLT	Gates/Grainger	BX90	Belts For Blower
VVED	FU600	Bussman	LPJ-225-SP	225A Time Delay Class J Fuse
VVED	FU601	Bussman	LPJ-50-SP	50A Time Delay Class J Fuse
VVED	FU603			
VVED	FU604			
VVED	FU602	Bussman	LP-CC-5A	5A Time Delay Class CC Fuse
VVED	FU650	Bussman	LP-CC-30	30A Fuse
VVED	FU660			
VVED	FU670			
VVED	FU680			
VVED	FU807	Bussman	AGC-10A	10A Fuse
VVED	FU808	Bussman	AGC-3A	3A Fuse
VVED	FU809			
VVED	FU810	Bussman	AGC-1A	1A Fuse
VVED	FU901	Bussman	AGC-.25	.25A Fuse
VVED	FU950	Bussman	AGC-.25	.25A Fuse
VVED	FU960			
VVED	FU970			
VVED	FU980			

4.2.4 Periodic Inspection

More thorough inspections are generally not required beyond the activities identified on the preventative maintenance schedules. Additional surveillance may be required following repair or modification of a particular component. For example, the issue of sloughing of the refractory lining is only a concern immediately following repair of the thermal oxidizer vessel where disturbance of the ceramic packing material is required. Following a repair where the packing material is removed, settling of the packing following startup is to be expected. Measures taken to verify that the packing has not settled significantly and that the refractory lining is in tact include measurement and recording of surface temperature at the upper flange, removal of the burner and visual inspection to verify the packing level, and completion of material and energy balances to determine heat loss from the vessel, which is a direct indication of sloughing of the refractory lining.

4.2.5 Revision to Preventative Maintenance Schedule

Details of past system failures and measures taken to correct them are collected and reported at 6-month intervals as part of the OCVZ Semiannual Data Report (INEEL 2000b). This information is collected in the "System Optimization and Maintenance" section of the data report. Information in this section of the report includes the details of any process enhancements, system repairs, changes to the preventative maintenance procedures, and any planned future modifications intended to increase process performance. This information is used to identify required changes to the preventative maintenance schedule to insure continued operational reliability.

5. MONITORING

The VOCs expected in the influent vapor stream for each type of unit are chloroform ($CHCl_3$), TCE, TCA, PCE, and CCl_4. The expected discharge of each compound and associated regulatory limit is documented in EDF-1901, *Operable Unit 7-08 Air Dispersion Modeling and Health Effects from Thermal and Catalytic Oxidation Unit Emissions at the Radioactive Waste Management Complex* (Case 2001). This Engineering Design File (EDF) provides information on dispersion of seven non-radioactive contaminants (i.e., $CHCl_3$, TCE, TCA, PCE, CCl_4, HCl, and Cl_2) generated from two thermal oxidation units (i.e., Units A and B) and one catalytic oxidation unit (i.e., Unit D) at the RWMC using the Industrial Source Complex Short Term 3 (ISCST3) model (EPA 1995). Results of the modeling indicate that estimated air concentrations will not exceed regulatory limits and standards (ARARs for the OCVZ RA) on and off the RWMC.

5.1 Air Emissions Regulations

As a CERCLA project (42 USC § 9601 et seq.), the detailed regulatory framework under which the RA is taken is defined by the ARARs set in the ROD. These represent the substantive requirements that are to be met by the OCVZ RA project. The ARARs and other requirements to be considered, as set by the ROD for the OCVZ RA, are presented in Table 11.

Table 11. ARARs and to be considered criteria for the OCVZ RA.

Statute	Regulation	Relationship
RCRA	IDAPA § 16.01.050.5005, (40 CFR 261.10, 261.20-261.24) "Idaho Rules, Regulations and Standards for Hazardous Waste."	Relevant and appropriate
	40 CFR 264.600 Subpart X, "Miscellaneous Units."	Relevant and appropriate
Clean Air Act	40 CFR 61.92, "National Emission Standards for Radionuclide Emission from DOE Facilities."	Applicable
	IDAPA § 16.01.01.577, "Ambient Air Quality Standards for Specific Air Pollutants."	Applicable
Idaho Toxic Air Pollutants Non-Carcinogenic Increments	IDAPA § 16.01.01.585, "Idaho Toxic Air Pollutants Non-Carcinogenic Increments."	Applicable
Idaho Toxic Air Pollutants Carcinogenic Increments	IDAPA § 16.01.01.586, "Idaho Toxic Air Pollutants Carcinogenic Increments."	Applicable
Idaho Rules for Control of Fugitive Dust	IDAPA § 16.01.01.651, "Idaho Rules for Control of Fugitive Dust."	Applicable
Idaho Demonstration of Preconstruction Compliance with Toxic Standards	IDAPA § 16.01.01.210.10, "Idaho Demonstration of Preconstruction Compliance with Toxic Standards."	Relevant and appropriate
DOE order	DOE Order 5820.2A, "Radioactive Waste	To be considered material

Statute	Regulation	Relationship
	Management."	

5.2 Air Emissions Modeling

The ISCST3 air model (EPA 1995) was used to evaluate the maximum 1-hour, 8-hour, and 24-hour concentrations at the RWMC, as well as the maximum annual concentrations at off-site locations. Results are compared with Occupational Exposure Values promulgated by the American Conference of Government Industrial Hygienists (ACGIH 2000), the Occupational Safety and Health Administration (OSHA), and the National Institute for Occupational Safety and Health (NIOSH) with State of Idaho ambient air standards (IDAPA Section 006), and with EPA health protective limits.

Complete details of the emission modeling technique, meteorological conditions, and results (including worker exposure and exposure risk assessment) are provided in *Operable Unit 7-08 Air Dispersion Modeling and Health Effects from Thermal and Catalytic Oxidation Unit Emissions at the Radioactive Waste Management Complex* (Case 2001). The DRE, applicable regulatory limits, and average emission rate for CCl_4 are collected in Table 12.

Table 12. Emission rates and regulations.

		Regulatory Limits (mg/m^3)				
Receptor	Averaging Time	Occupational Exposure Value[a]	Carcinogens[b]	Noncarcinogens[b]	Maximum Modeled Concentration (mg/m^3)	Comparison of Modeled Results with Regulatory Limits
Collocated worker	Annual	N/A	9.9E-04[c]	N/A	6.86E-06	<Risk limit of 1E-06
Maximum worker	8 hours (TWA)[d]	31 (ACGIH)	N/A	N/A	1.17E-02	<TWA
	1 hour (STEL)[e]	12.6 (NIOSH)	N/A	N/A	1.68E-02	<STEL
	Peak (CEIL)[f]	157.5 (OSHA)	N/A	N/A	8.42E-02	< CEIL
	Annual	N/A	5.2E-04[g]	N/A	6.05E-05	< Risk limit of 1E-06
General public	24 hours	N/A	N/A	N/A	1.80E-04	N/A
	Annual	N/A	6.7E-05[h]	N/A	1.01E-06	< AACC

a. The maximum OEV established by American Conference of Industrial Hygienists (ACGIH), the Occupational Safety and Health Administration (OSHA) or the National Institute for Occupational Safety and Health (NOISH) in ACGIH (1999).

b. Carbon tetrachloride (CCl_4) is classified as a carcinogen.

c. Based on a lower acceptable risk limit of 1E-06, a cancer slope factor of 5.32E-02 (mg/kg/day)-1 (EPA 1997) and a lifetime average daily dose (LADD) of 0.019 × air concentration (mg/kg/day) for workers engaged in light activity at the RWMC.

d. TWA = time-weighted average exposure concentration for a conventional 8-hour or up to a 10-hour workday and a 40-hour workweek.

e. STEL = short-term exposure limit; usually a 15-minute TWA exposure that should not be exceeded at any time during a workday. For CC14, the time is for 1 hour.

f. CEIL = ceiling limit; the concentration that shall not be exceeded during any part of the working exposure. For CC14, the CEIL of 25 ppm was converted to 157.5 mg/m3.

g. Based on a lower acceptable risk limit of 1E-06, a cancer slope factor of 5.32E-02 (mg/kg/day)-1 (EPA 1997) and a LADD of 0.036 × air concentration (mg/kg/day) for workers engaged in moderate activity at the RWMC.

h. State of Idaho acceptable ambient concentration for carcinogens (AACC) value for CC14 (annual average) (IDAPA 58.01.01).

Complete details of the emission modeling technique, meteorological conditions, and results, including worker exposure and exposure risk assessment, are being developed in EDF-1901, "Air Dispersion Modeling and Health Effects from Thermal Oxidation Unit Emissions at the RWMC," (Case 2001).

5.3 Emission Monitoring

5.3.1 Open-Path Fourier Transform Infrared Spectrometry

The concentrations of VOC constituents and HCl are monitored at the ground level using open-path fourier transform infrared spectrometers (FTIRS). Collected data provide an indication of worker exposure to various hazardous materials. The open-path FTIRS data are used in conjunction with dispersion modeling to provide an estimate of total emissions from each of the oxidizer units. Ground level monitoring has also been performed using the FTIRS. Personnel monitors are planned to be used to measure worker exposure to various hazardous compounds. Exposure assessments have been completed by industrial hygienists for each VVET Technician.

5.3.2 Stack Monitoring

Direct measurement of hazardous constituent concentrations provides a direct indication of total emissions for each of the oxidizer units. Future performance testing will be completed using on-site resources including instrumentation, personnel, and analytical laboratories to minimize cost. At a minimum, performance tests will be completed when a significant change to the system configuration has occurred (e.g., addition of new wells). Estimated average contaminant emission rates, based on average daily measured inlet concentrations during calendar year 2000, are provided in Table 13.

Table 13. Estimated average contaminant emission rates.

	Mol. Wt.	Average Emission Rate (lb/hour)			Average Emission Rate (g/second)		
Contaminant	(g)	Unit A	Unit B	Unit D	Unit A	Unit B	Unit D
Carbon tetrachloride (CCl_4)	153.92	1.86E-02	1.10E-02	2.92E-05	2.34E-03	1.38E-03	3.68E-06
Chloroform ($CHCl_3$)	119.36	4.12E-03	2.35E-03	5.66E-06	5.19E-04	2.97E-04	7.13E-07
1,1,1-trichloroethane (TCA)	133.4	8.86E-04	6.07E-04	2.98E-06	1.12E-04	7.65E-05	3.75E-07
Trichloroethene (TCE)	131.39	3.66E-03	2.59E-03	1.10E-05	4.62E-04	3.27E-04	1.39E-06
Tetrachloroethylene (PCE)	165.83	4.40E-04	5.03E-04	3.70E-06	5.55E-05	6.34E-05	4.66E-07
Hydrochloric acid (HCl)	36.46	1.46E+00	8.96E-01	1.57E+00	1.84E-01	1.13E-01	1.98E-01
Chlorine gas (Cl_2)	70.91	1.44E-02	8.80E-03	1.55E-02	1.81E-03	1.11E-03	1.95E-03

6. OCVZ VAPOR MONITORING AND EXTRACTION WELLS

The RA includes installation, operation, and maintenance of OCVZ vapor monitoring and extraction wells to optimize VOC mass removal. Three of the five original extraction wells provide active extraction. Impermeable zones and well fouling have prohibited extraction from at least two wells. Completion of additional extraction wells is planned in FY 2003 that will enhance the capability of the new catalytic unit. Up to four wells can be connected through a manifold to the new catalytic unit (Unit D) to provide a greater zone of extraction influence. Preliminary locations of additional wells to be drilled are shown in the *Statement of Work for OU 7-08 Monitoring and Extraction Well Installations* (Casper 2001).

6.1 OCVZ Vapor and Extraction Wells

Figure 3 provides a map of the vapor and extraction well locations at the SDA, and Figures 4 and 5 show the extraction intervals and vapor port depths for all OCVZ wells, respectively.

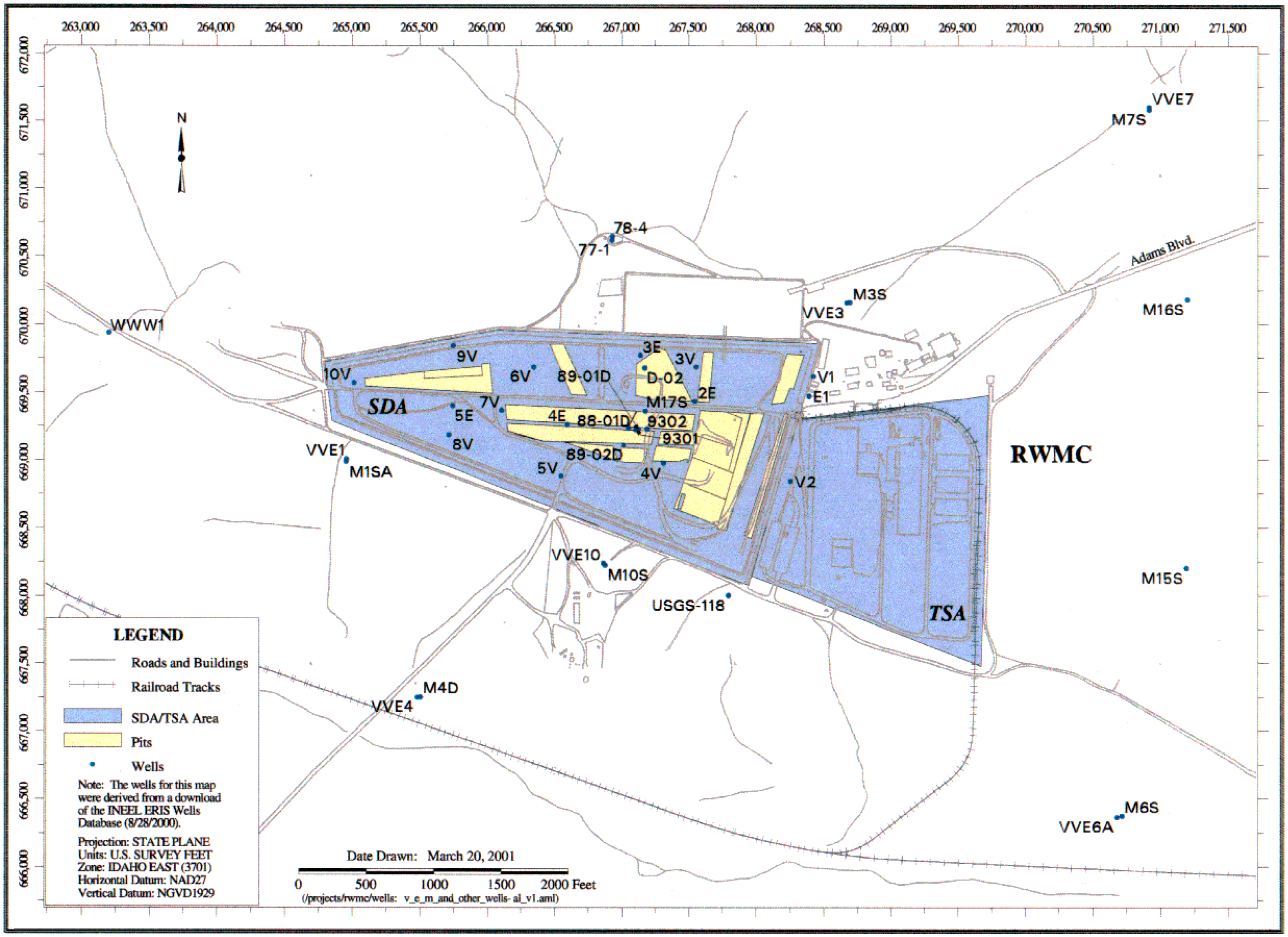


Figure 3. Wells with vapor sampling ports in the vicinity of the RWMC (Wells OCVZ-11, M11S, OCVZ-13, M13S, OCVZ-14, and M14S are not shown).

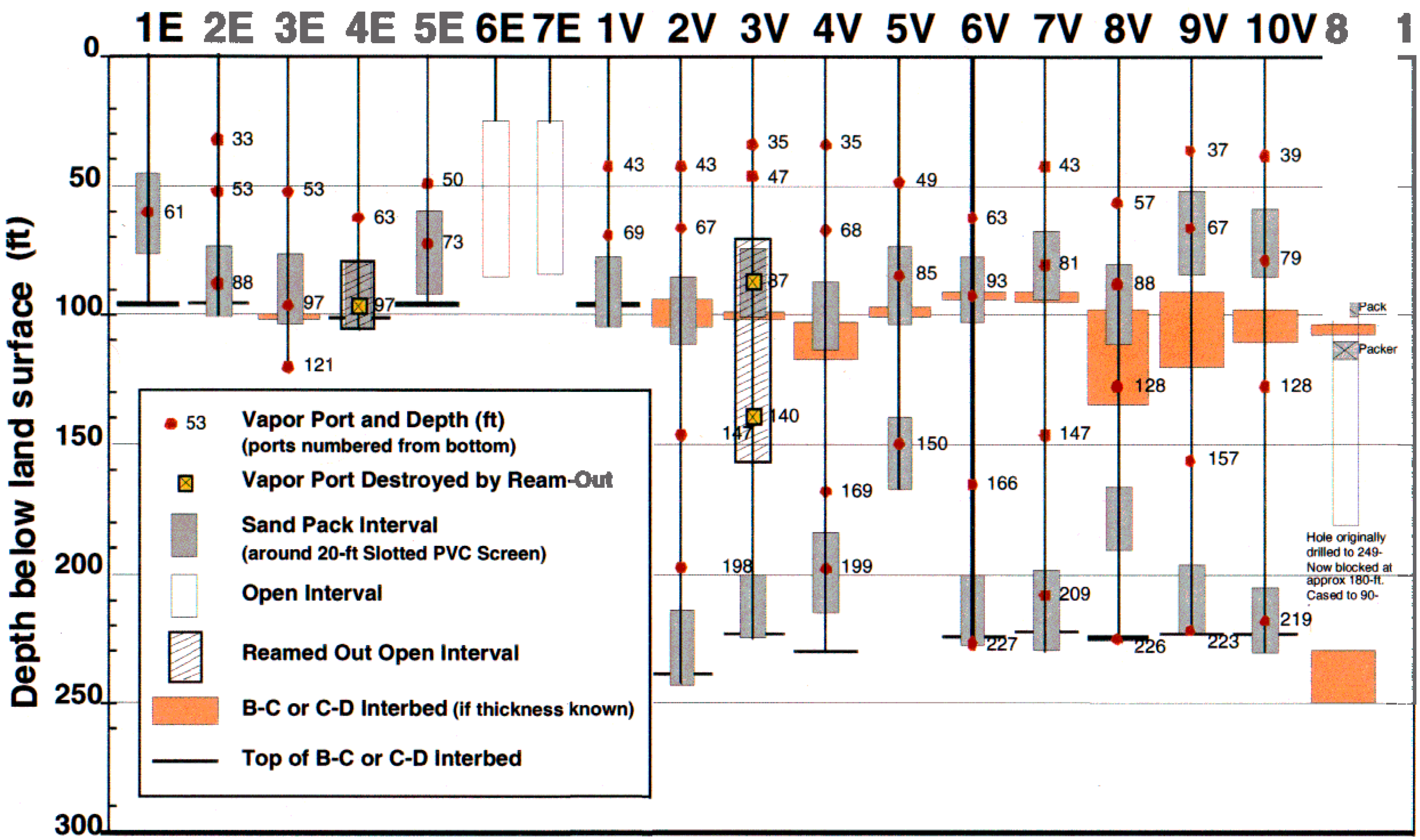


Figure 4. Extraction intervals and vapor port depths in OCVZ wells with an extraction interval at the SDA.

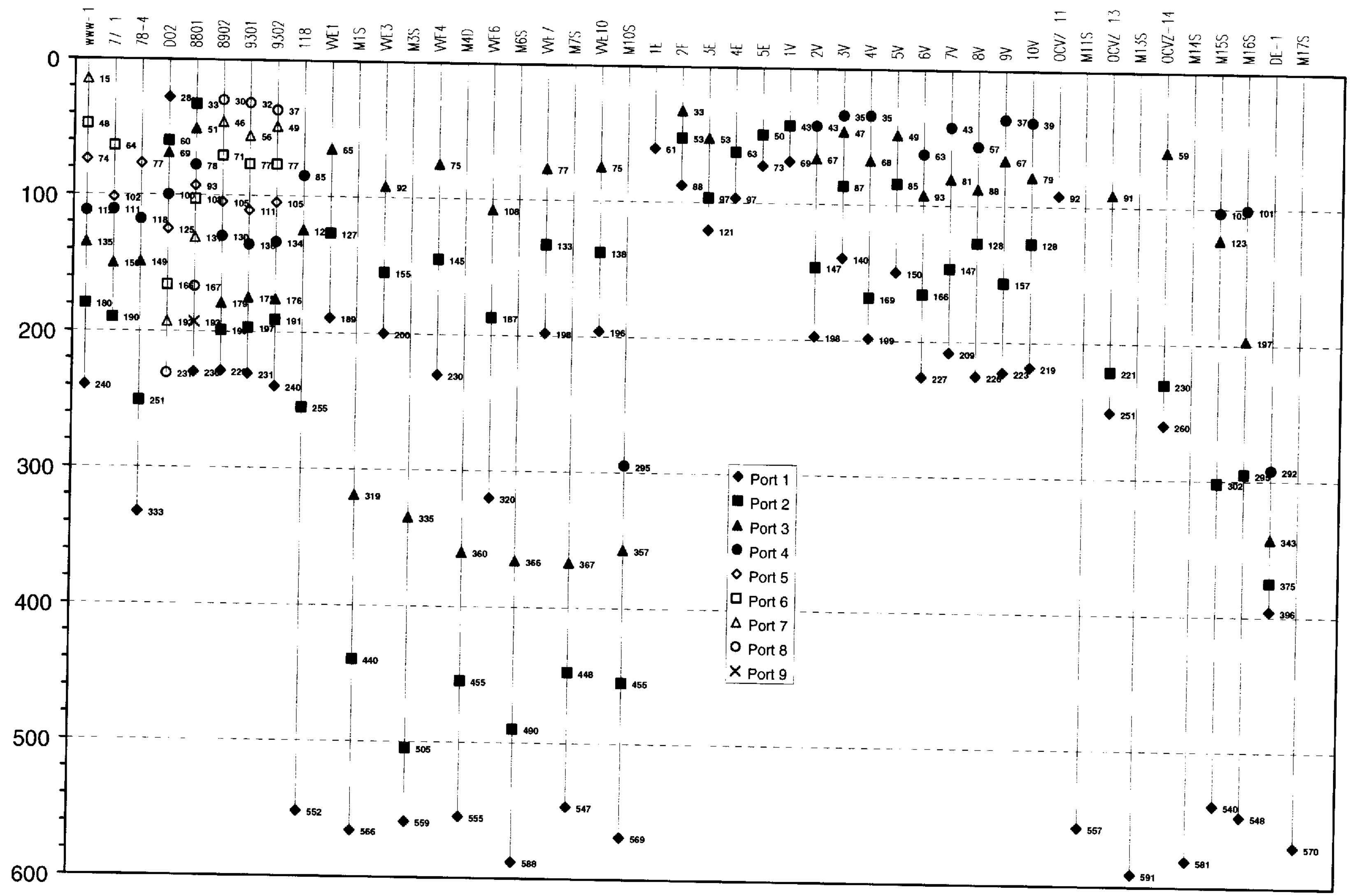


Figure 5. Vapor port depths in all OCVZ vapor monitoring wells.

7. OU 7-08 PROJECT PERSONNEL

This section identifies the roles and responsibilities of OU 7-08 key personnel. The OU 7-08 organizational chart is presented in Figure 6.

7.1 Program Personnel

7.1.1 Project Manager

The PM has the following roles and responsibilities:

- Implementing the OCVZ RA to meet the RA objectives of the OU 7-08 ROD (DOE-ID 1994), and coordinating with the DOE, the EPA, and the Idaho Department of Environmental Quality to develop and implement OCVZ RA strategies
- Having overall responsibility for project authorization basis
- Having overall responsibility for personnel staffing
- Ensuring that program and field personnel are aware of project and programmatic objectives and priorities
- Overseeing control account and work package development, monitoring, and performance measurement
- Managing scope, schedule, and cost on OCVZ work packages
- Weekly and monthly reporting on OCVZ accomplishments, planned activities, and issues
- Developing and maintaining of the OCVZ Project Execution Plan
- Performing and documenting OCVZ project self-assessments
- Coordinating technical oversight, administration, and consultation, in addition to planning for environment, safety, health, and quality assurance
- Reviewing and revising the OCVZ project team individual training plans
- Maintaining CERCLA project documentation
- Coordinating the generation of requests for proposals
- Evaluating and selecting vendor bid proposals
- Managing scope, schedule, and cost on OCVZ subcontracts
- Coordinating planning for project testing and turnover for VVET construction projects
- Obtaining operational readiness acceptance from the nuclear facilities manager

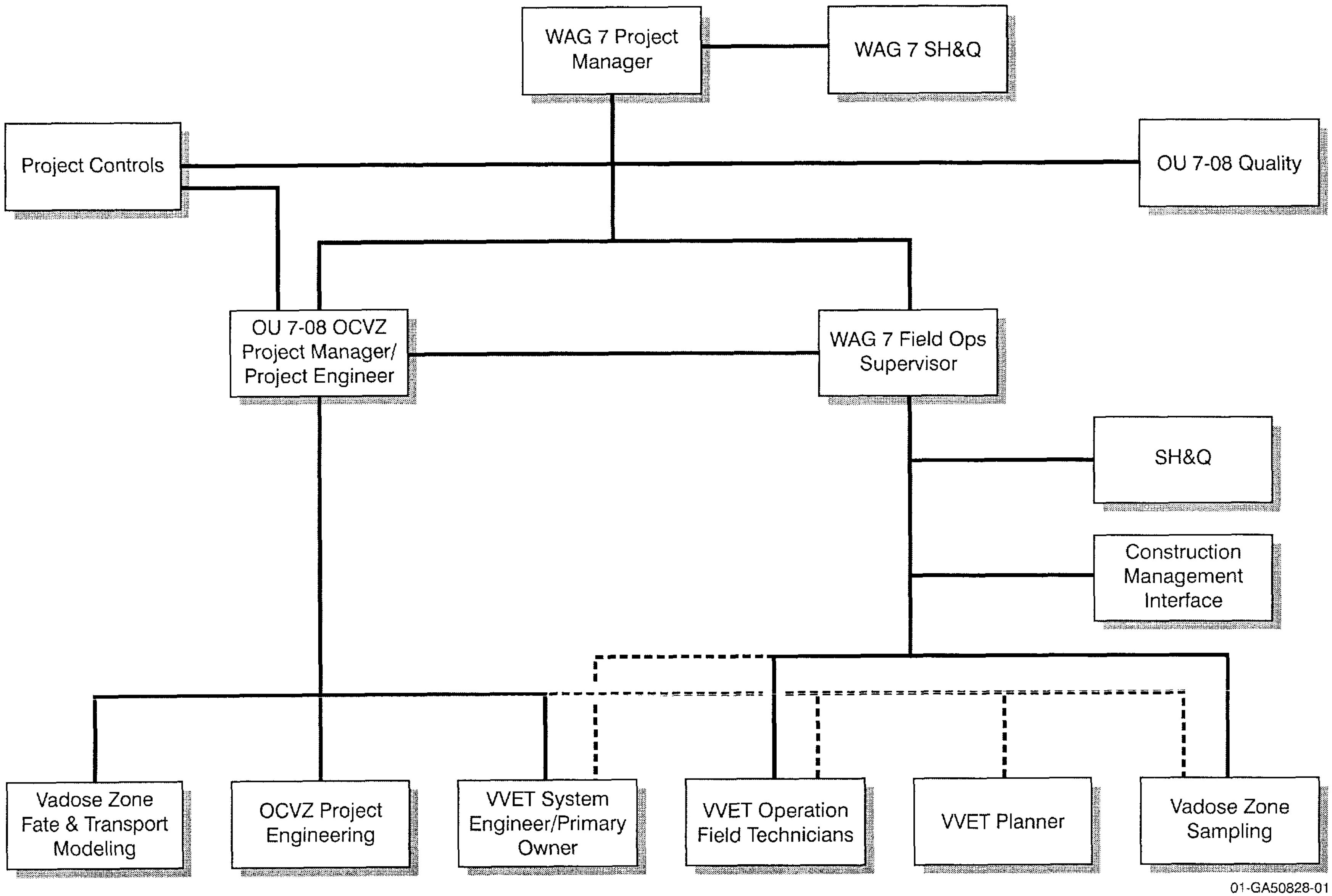


Figure 6. Operable Unit 7-08 organization chart (all positions are held by INEEL employees).

- Assigning personnel to prepare test procedures for each identified System Operability Test and Integrated Test on the VVET systems

- Conducting the final inspection walk-through (with representatives from the involved organizations) and generating a punch list of deficiencies that must be corrected or repaired by the subcontractor before the project is ready for final transfer

- Initiating transfer of ownership from the subcontractor or direct hire to the project

- Initiating and ensuring that corrective actions have been performed to resolve any deficiencies with the subcontractor or direct hire. This includes verification and documentation that corrective actions have been completed.

7.1.2 Project Engineer

The OU 7-08 project engineer (PE) has the following roles and responsibilities:

- Overall technical quality of OCVZ project deliverables

- Technical oversight and direction in development and acceptance of OCVZ products and deliverables

- Technical staffing of OCVZ projects.

7.1.3 Vadose Zone Fate and Transport System Engineer

The lead vadose zone fate and transport system engineer has the following roles and responsibilities:

- Developing and maintaining the OU 7-08 vadose zone fate and transport model

- Calibrating the OU 7-08 vadose zone model to subsurface gas pressure data, operations removal data, subsurface monitoring data, and inventory data

- Conducting vadose zone model sensitivity and uncertainty analyses

- Providing technical input for OCVZ operations strategy.

7.1.4 OCVZ Project Engineering

The project engineering team has the following roles and responsibilities:

- Coordinating with assigned engineering personnel to complete technical specifications, EDFs, and drawings

- Coordinating with assigned engineering personnel to develop and maintain system design documentation and technical and functional requirements of the VVET system

- Coordinating with assigned engineering personnel to design the OCVZ well monitoring and extraction system

- Developing and maintaining the OCVZ O&M Plan
- Deploying the flux chamber and collecting, reporting, and maintaining data
- Performing shallow soil gas surveys (i.e., probe installation, sampling, and analysis)
- Preparing the OCVZ Environmental and Operational Semiannual Data Report (INEEL 2000b)
- Researching and developing subsurface VOC fate and transport mechanisms
- Preparing VOC source term evaluation report
- Modeling operational air dispersion
- Deploying FTIRS emissions monitoring
- Reporting air emissions
- Preparing environmental compliance documentation
- Sampling and analyzing VVET system off-gas
- Researching and implementing well remediation techniques
- Preparing quarterly well vapor trending reports and annual well monitoring report
- Providing technical input to the system engineer for procedures to inspect, test, and operate VVET system and subsystem components
- Developing and maintaining the VVET Software Configuration Management Plan (PLN-687) to cover Program Logic Controller and Supervisory Control and Data Acquisition software changes
- Maintaining the VVET program logic controller
- Maintaining the VVET Supervisory Control and Data Acquisition System
- Establishing and maintaining the communications networking capability
- Providing design and drafting support to the system engineer to maintain VVET essential drawings and documentation
- Providing engineering support to the system engineer to develop, implement, and close out engineering change forms for the VVET system
- Providing engineering support to field technicians, planners, and samplers when requested by the system engineer.

7.2 Field Personnel

7.2.1 Waste Area Group 7 Field Operations Supervisor

The WAG 7 field operations supervisor has the following roles and responsibilities:

- Serving as the point of contact (POC) for coordination with the site area director, as appropriate
- Providing advanced notice to the site area director (or designee) of scheduled activities, including documents requiring RWMC review, and approvals that impact site area operations
- Providing advanced notice of site area operations that impact ER project activities
- Ensuring that the requirements of project authorization basis are met
- Ensuring that field team personnel follow RWMC environment, safety, health, and quality assurance and operating requirements
- Ensuring that project plan of the day (POD) meetings, tailgate safety meetings, and readiness reviews are performed, as required, and attended by the appropriate WAG 7 personnel
- Providing input to ER weekly and monthly project reviews in the form of field progress photos, field operations metrics, field safety statistics, and preventive measures
- Providing field labor staffing projections and issues associated with any aspects of field operations
- Providing oversight of subcontract activities for installation of VVET oxidizers
- Providing oversight of subcontract activities for installation of monitoring and extraction wells
- Interfacing with construction management personnel, including the subcontractor technical representatives, to manage scope, schedule, and cost of field construction activities
- Maintaining WAG 7 interface agreements with the RWMC
- Ensuring compliance for all field activities relative to quality assurance, safety, and regulatory compliance
- Coordinating, prioritizing, and tracking heavy equipment use in the field
- Complying with and implementing all WAG 7 specific field operations, procedures, and requirements
- Providing input to the annual work plan in the form of resource-loaded schedules and staffing projections for field staff
- Ensuring that field activities are performed in accordance with the design and environmental regulatory safety, health, and quality assurance standards

- Resolving Issue Communication and Resolution Environment (ICARE) issues tied to field activities
- Ensuring that proper procedures and appropriate training are completed prior to the start of any field operations (i.e., conduct of operations)
- Being responsible for starting up new field activities
- Developing and maintaining the VVET Technician Training Plan and Qualification Checklist (see Appendix C)
- Ensuring that all field activities, which may include maintenance, construction, operations, field sampling and other field activities within WAG 7, are conducted in compliance with ISMS requirements and associated work orders or procedures
- Coordinating all activities with the appropriate RWMC facilities maintenance and operations managers
- Obtaining and coordinating all resources needed to implement the WAG 7 field work, including equipment, labor, and administrative or technical permits and approvals
- Participating in constructability reviews and ensuring that POD meetings, tailgate safety meetings, and readiness reviews are performed as required
- Monitoring and performing of field activities in accordance with established cost and schedule
- Interfacing with RWMC landlord on office space
- Consulting with the PM and PE on field labor staffing.

7.2.2 VVET Operations Field Technician Lead

The VVET operations field technician lead has the following roles and responsibilities:

- Having overall responsibility for safe, efficient, reliable, and compliant VVET system operation
- Coordinating and overseeing of day-to-day VVET field activities
- Assigning work activities to other technicians
- Serving as the POC for daily technician coverage
- Serving as the primary POC for access to the VVET system operations
- Delegating lead technician responsibilities when the lead technician is unavailable
- Performing routine surveillance and operational checks
- Completing daily round sheets and operating logbooks

- Providing input to planner for work orders in accordance with STD-101, "Integrated Work Control Process," for VVET system maintenance and upgrades
- Providing oversight and support of VVET system monthly, quarterly, semiannual, and annual preventive maintenance
- Providing oversight and support of VVET system corrective maintenance
- Providing oversight and support of VVET system performance upgrades
- Providing oversight and support of VVET system instrument calibration
- Maintaining and tracking VVET system spare parts inventory
- Planning, scheduling, and overseeing VVET system operations waste management activities.

7.2.3 VVET System Engineer and Primary Owner

The VVET system engineer has the following roles and responsibilities:

- Serving as the single POC for the PM and PE for resolving technical issues for each assigned VVET job from initiation to completion
- Reporting on a weekly and monthly basis to the PM and PE on VVET system accomplishments, planned activities, and issues with input from technicians, planners, and samplers
- Having overall responsibility for work completion on the VVET systems
- Identifying hazards associated with VVET system work scope
- Providing technical review and approval of corrective maintenance, preventive maintenance, and predictive maintenance work control documents
- Coordinating with assigned engineering personnel to complete configuration control and design criteria requirements for work orders implementing system structure and component modifications
- Coordinating with assigned engineering personnel to identify spare parts and inventories
- Coordinating with planner to order and store spare parts
- Coordinating with assigned engineering personnel to identify equipment and component calibration requirements
- Having overall responsibility for safe, efficient, reliable, and compliant VVET system maintenance
- Developing technical expertise for the VVET system
- Ensuring the technical adequacy of the VVET system
- Monitoring and tracking the status of the system (especially during system changes)

- Conducting or observing equipment performance monitoring
- Reviewing and approving post-modification and post-maintenance tests
- Ensuring that design documents accurately reflect the design basis
- Preparing, implementing, and closing out engineering change forms for the VVET system
- Maintaining VVET system master equipment list
- Maintaining VVET system drawings
- Preparing inspection and test documentation for the VVET system and subsystem components
- Assisting VVET technicians in troubleshooting VVET system operational problems
- Supporting field installation activities for new oxidizer systems
- Preparing or modifying VVET system operating procedures
- Preparing or modifying RWMC Conduct of Operations supplemental procedures to incorporate OCVZ operations
- Maintaining OCVZ field project files.

7.2.4 VVET Planners

The VVET planners have the following roles and responsibilities:

- Preparing work control documents, as required, for operations and construction work
- Ensuring that input to such work orders is obtained from the system engineer or PE and that field walkdowns are conducted at a minimum by the system engineer, PE (or designee), the safety representative, the quality representative, and the RWMC representative
- Providing daily and weekly work requirements to RWMC interface or scheduler for POD and plan of the week schedules
- Tracking the status of work control documents, including closure, in a timely manner
- Ordering, storing, and maintaining the inventory of spare parts, as identified by the system engineer.

7.2.5 Vadose Zone Sampler

The vadose zone sampler has the following roles and responsibilities:

- Performing monthly and quarterly sampling of vapor monitoring wells
- Performing VOC analysis on VVET daily operational samples and monthly and quarterly well vapor samples
- Maintaining sampling equipment (e.g., pumps and vapor ports)
- Maintaining analytical equipment (e.g., Bruel and Kjar gas analyzer)
- Reporting operational sample results to assigned engineering personnel to support mass loss calculations
- Reporting well vapor data to assigned engineering personnel to support development of well vapor trending reports and annual well monitoring report.

7.3 VVET Technician Training Plan and Training Qualification Checklist

A VVET technician training plan and a qualification program are followed to ensure that the technicians receive the training required to support safe performance of field activities. These activities include startup, operation, shutdown, and operational checks of the VVET units, and response to system abnormal conditions. The VVET Technician Training Plan and VVET Technician Training Qualification Checklist are provided in Appendix C.

8. REFERENCES

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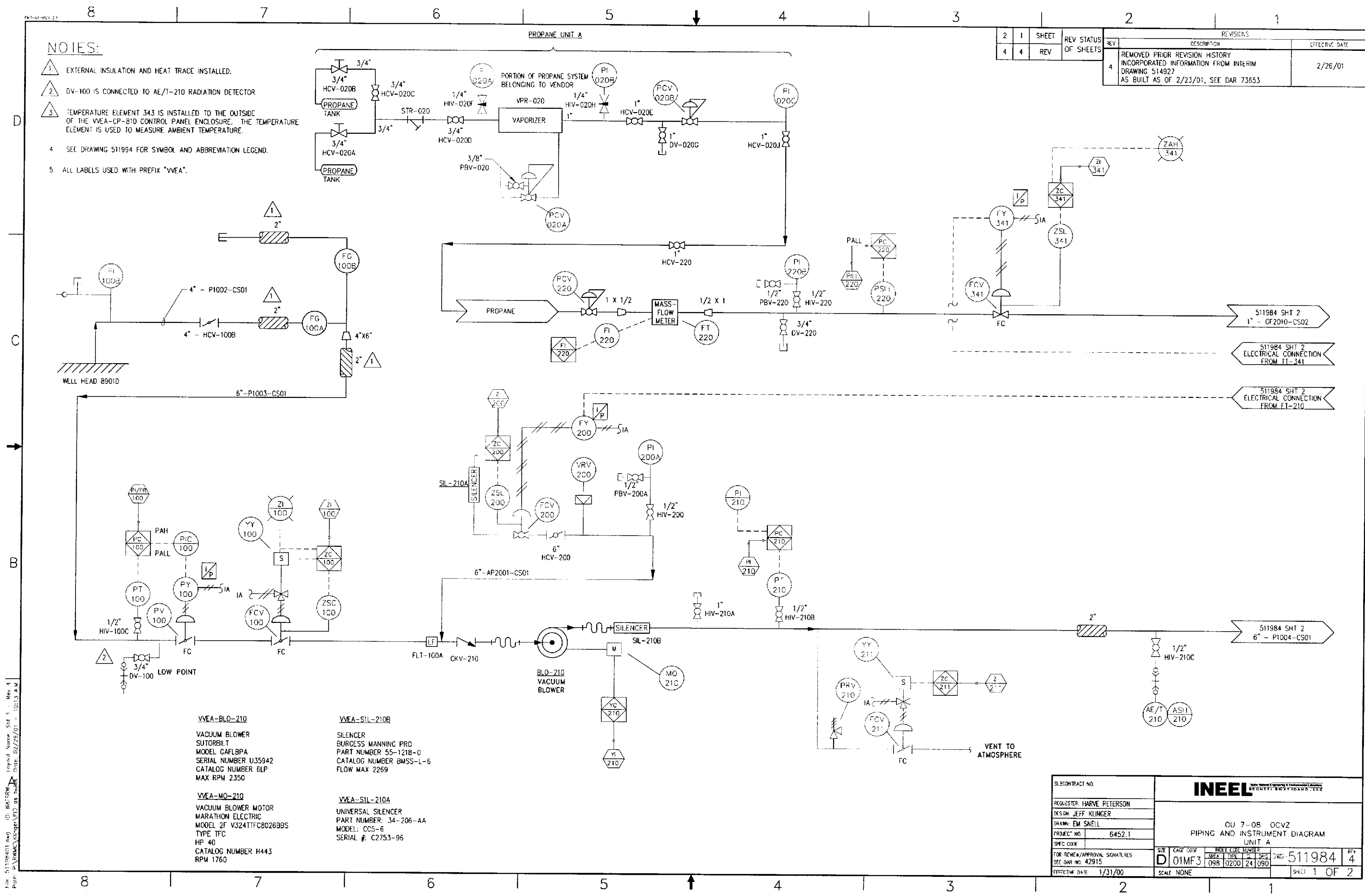
Appendix A

Vapor Vacuum Extraction with Treatment Oxidizer Piping and Instrumentation Diagrams for VVET Units A, B, and D

VVET Unit A


PROPANE UNIT A
NOTES:
1. EXTERNAL INSULATION AND HEAT TRACE INSTALLED.
2. DV-100 IS CONNECTED TO AE/T-210 RADIATION DETECTOR.
3. TEMPERATURE ELEMENT 343 IS INSTALLED TO THE OUTSIDE OF THE VVEA-CP-810 CONTROL PANEL ENCLOSURE. THE TEMPERATURE ELEMENT IS USED TO MEASURE AMBIENT TEMPERATURE.
4. SEE DRAWING 511994 FOR SYMBOL AND ABBREVIATION LEGEND.
5. ALL LABELS USED WITH PREFIX "VVEA".
PORTION OF PROPANE SYSTEM BELONGING TO VENDOR
VAPORIZER
PROPANE TANK
PROPANE
MASS FLOW METER
WELL HEAD 8901D
LOW POINT
BLO-210 VACUUM BLOWER
VENT TO ATMOSPHERE
511984 SHT 2 1" - GF2010-CS02
511984 SHT 2 ELECTRICAL CONNECTION FROM TT-341
511984 SHT 2 ELECTRICAL CONNECTION FROM FT-210
511984 SHT 2 6" - P1004-CS01
VVEA-BLO-210
VACUUM BLOWER
SUTORBILT
MODEL GAFLBPA
SERIAL NUMBER U35942
CATALOG NUMBER 6LP
MAX RPM 2350
VVEA-MO-210
VACUUM BLOWER MOTOR
MARATHON ELECTRIC
MODEL 2F VJ24TTFC8026BBS
TYPE TFC
HP 40
CATALOG NUMBER H443
RPM 1760
VVEA-SIL-210B
SILENCER
BURGESS MANNING PRO
PART NUMBER 55-1218-0
CATALOG NUMBER BMSS-L-6
FLOW MAX 2269
VVEA-SIL-210A
UNIVERSAL SILENCER
PART NUMBER: 34-206-AA
MODEL: CCS-6
SERIAL #: C2753-96
REVISIONS
4 REMOVED PRIOR REVISION HISTORY INCORPORATED INFORMATION FROM INTERIM DRAWING 514927 AS BUILT AS OF 2/23/01, SEE DAR 73653 2/26/01
INEEL
REQUESTER HARVE PETERSON
DESIGN JEFF KLINGER
DRAWN EM SNELL
PROJECT NO. 6452.1
FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO. 42915
EFFECTIVE DATE 1/31/00
OU 7-08 OCVZ
PIPING AND INSTRUMENT DIAGRAM
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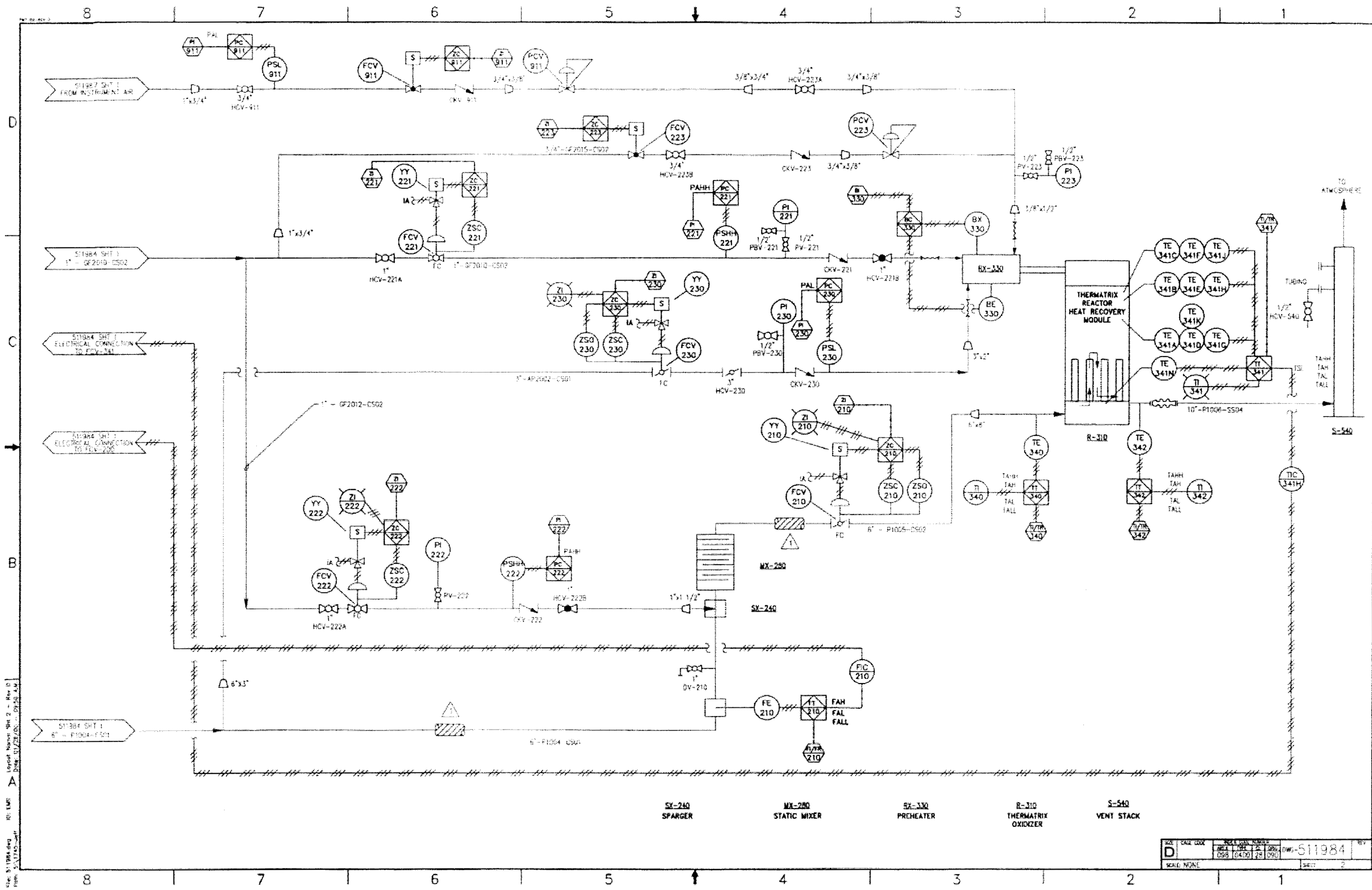
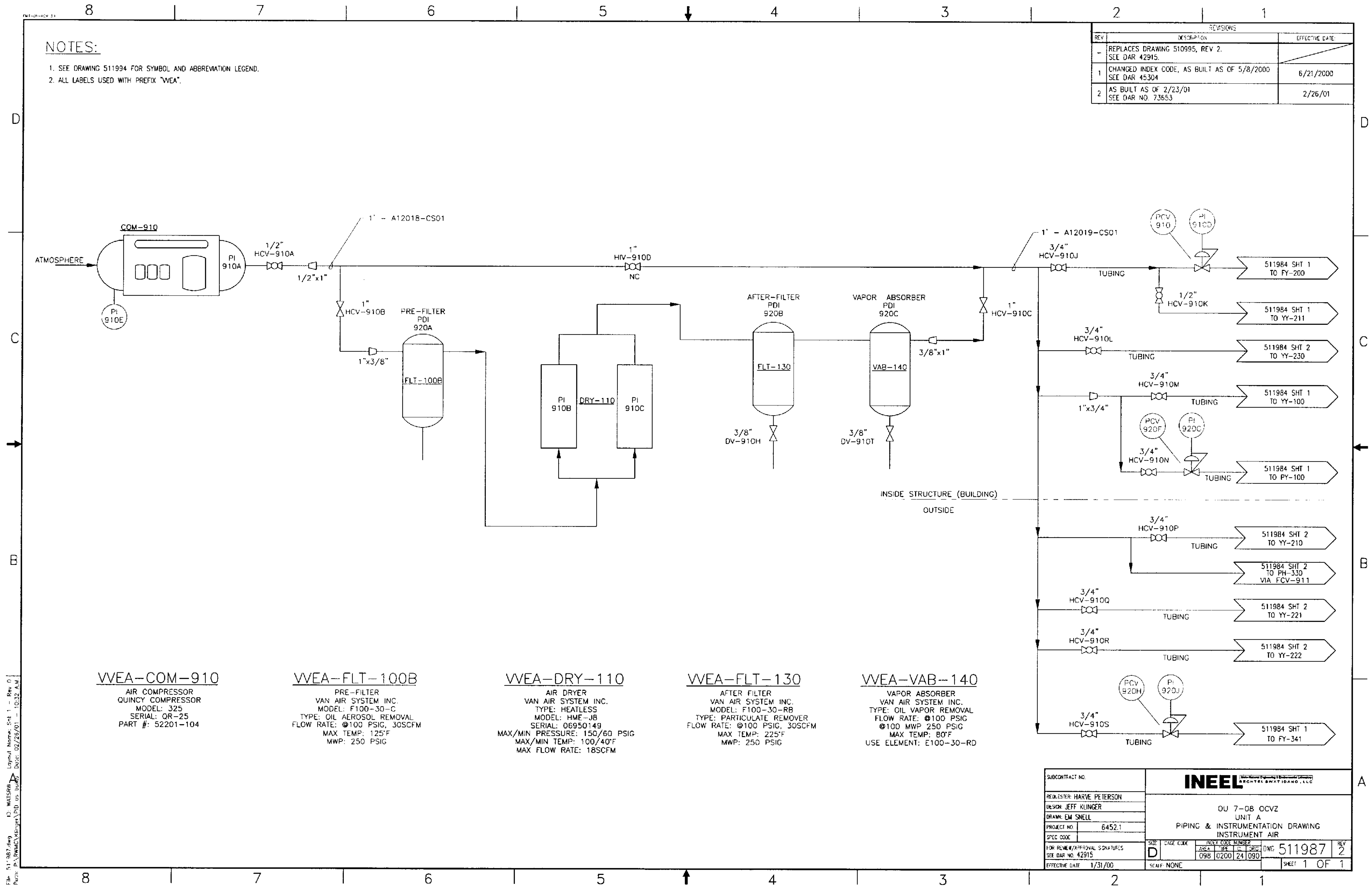
D 01MF3 098 0200 24 090
511984 4
SCALE NONE
SHEET 1 OF 2

VVET Unit A

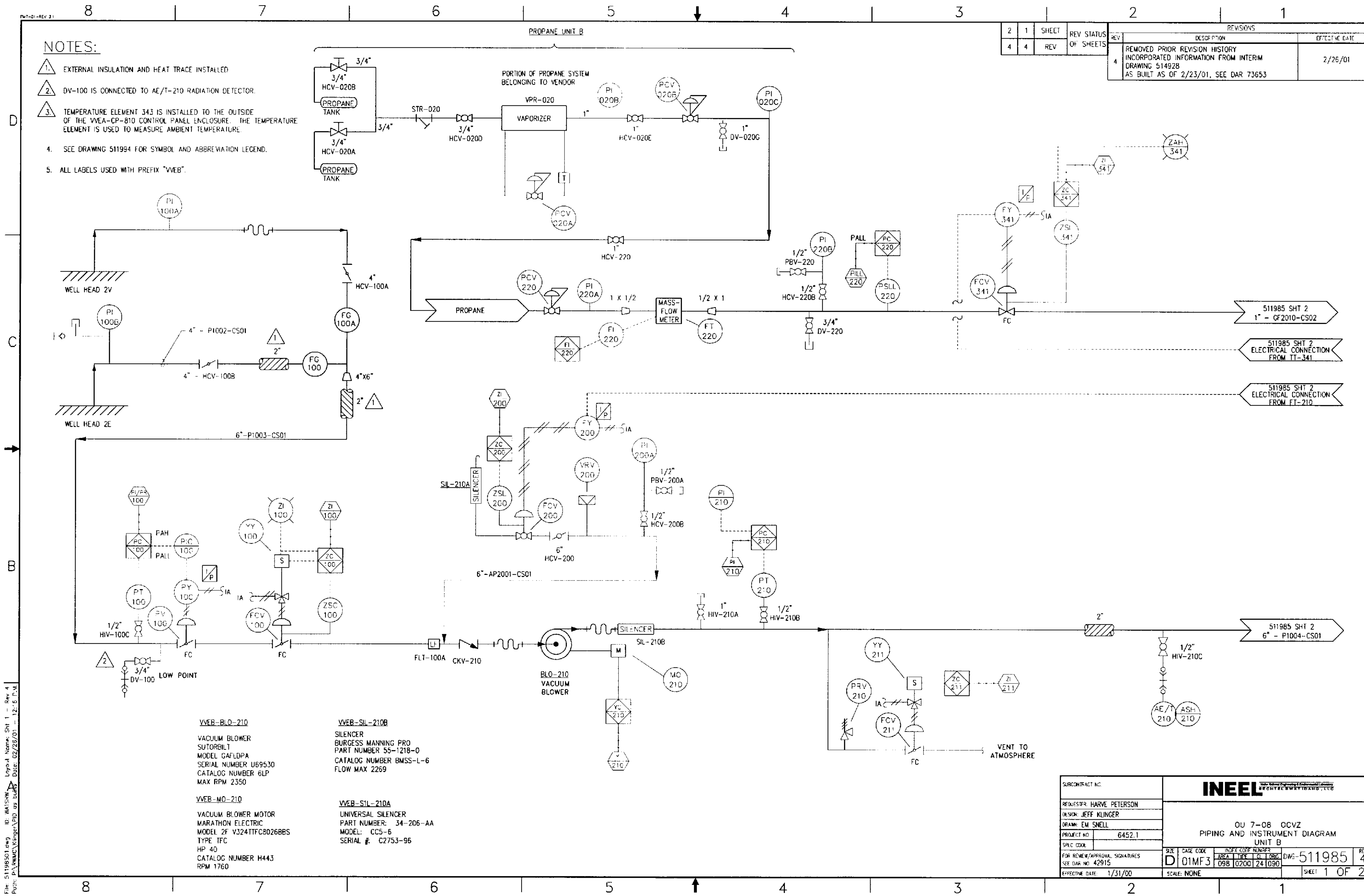

THERMATRIX REACTOR HEAT RECOVERY MODULE
R-310
S-540
TO ATMOSPHERE
RX-330
MX-280
SX-240
SX-240 SPARGER
MX-280 STATIC MIXER
RX-330 PREHEATER
R-310 THERMATRIX OXIDIZER
S-540 VENT STACK
DWG-511984
SCALE NONE

VVET Unit A



NOTES:
1. SEE DRAWING 511994 FOR SYMBOL AND ABBREVIATION LEGEND.
2. ALL LABELS USED WITH PREFIX "VVEA".
REVISIONS
REPLACES DRAWING 510995, REV 2. SEE DAR 42915.
CHANGED INDEX CODE, AS BUILT AS OF 5/8/2000 SEE DAR 45304 6/21/2000
AS BUILT AS OF 2/23/01 SEE DAR NO. 73653 2/26/01
VVEA-COM-910
AIR COMPRESSOR
QUINCY COMPRESSOR
MODEL: 325
SERIAL: QR-25
PART #: 52201-104
VVEA-FLT-100B
PRE-FILTER
VAN AIR SYSTEM INC.
MODEL: F100-30-C
TYPE: OIL AEROSOL REMOVAL
FLOW RATE: @100 PSIG, 30SCFM
MAX TEMP: 125°F
MWP: 250 PSIG
VVEA-DRY-110
AIR DRYER
VAN AIR SYSTEM INC.
TYPE: HEATLESS
MODEL: HME-J8
SERIAL: 06950149
MAX/MIN PRESSURE: 150/60 PSIG
MAX/MIN TEMP: 100/40°F
MAX FLOW RATE: 18SCFM
VVEA-FLT-130
AFTER FILTER
VAN AIR SYSTEM INC.
MODEL: F100-30-RB
TYPE: PARTICULATE REMOVER
FLOW RATE: @100 PSIG, 30SCFM
MAX TEMP: 225°F
MWP: 250 PSIG
VVEA-VAB-140
VAPOR ABSORBER
VAN AIR SYSTEM INC.
TYPE: OIL VAPOR REMOVAL
FLOW RATE: @100 PSIG
@100 MWP 250 PSIG
MAX TEMP: 80°F
USE ELEMENT: E100-30-RD
INSIDE STRUCTURE (BUILDING)
OUTSIDE
INEEL
OU 7-08 OCVZ
UNIT A
PIPING & INSTRUMENTATION DRAWING
INSTRUMENT AIR
REQUESTER HARVE PETERSON
DESIGN JEFF KLINGER
DRAWN EM SNELL
PROJECT NO 6452.1
SEE DAR NO. 42915
EFFECTIVE DATE 1/31/00
SCALE NONE
DWG 511987
SHEET 1 OF 1

VVET Unit B


NOTES:
1. EXTERNAL INSULATION AND HEAT TRACE INSTALLED.
2. DV-100 IS CONNECTED TO AE/T-210 RADIATION DETECTOR.
3. TEMPERATURE ELEMENT 343 IS INSTALLED TO THE OUTSIDE OF THE VVEA-CP-810 CONTROL PANEL ENCLOSURE. THE TEMPERATURE ELEMENT IS USED TO MEASURE AMBIENT TEMPERATURE.
4. SEE DRAWING 511994 FOR SYMBOL AND ABBREVIATION LEGEND.
5. ALL LABELS USED WITH PREFIX "VVEB".
PROPANE UNIT B
PORTION OF PROPANE SYSTEM BELONGING TO VENDOR
VAPORIZER
PROPANE TANK
PROPANE
MASS-FLOW METER
WELL HEAD 2V
WELL HEAD 2E
6"-P1003-CS01
4" - P1002-CS01
6"-AP2001-CS01
BLO-210 VACUUM BLOWER
LOW POINT
VENT TO ATMOSPHERE
511985 SHT 2 1" - GF2010-CS02
511985 SHT 2 ELECTRICAL CONNECTION FROM TT-341
511985 SHT 2 ELECTRICAL CONNECTION FROM FT-210
511985 SHT 2 6" - P1004-CS01
VVEB-BLO-210
VACUUM BLOWER
SUTORBILT
MODEL GAFLDPA
SERIAL NUMBER U69530
CATALOG NUMBER 6LP
MAX RPM 2350
VVEB-MO-210
VACUUM BLOWER MOTOR
MARATHON ELECTRIC
MODEL 2F V324TTFC8026BBS
TYPE TFC
HP 40
CATALOG NUMBER H443
RPM 1760
VVEB-SIL-210B
SILENCER
BURGESS MANNING PRO
PART NUMBER 55-1218-0
CATALOG NUMBER BMSS-L-6
FLOW MAX 2269
VVEB-SIL-210A
UNIVERSAL SILENCER
PART NUMBER: 34-206-AA
MODEL: CCS-6
SERIAL #: C2753-96
REVISIONS
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REQUESTER HARVE PETERSON
DESIGN JEFF KLINGER
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PROJECT NO 6452.1
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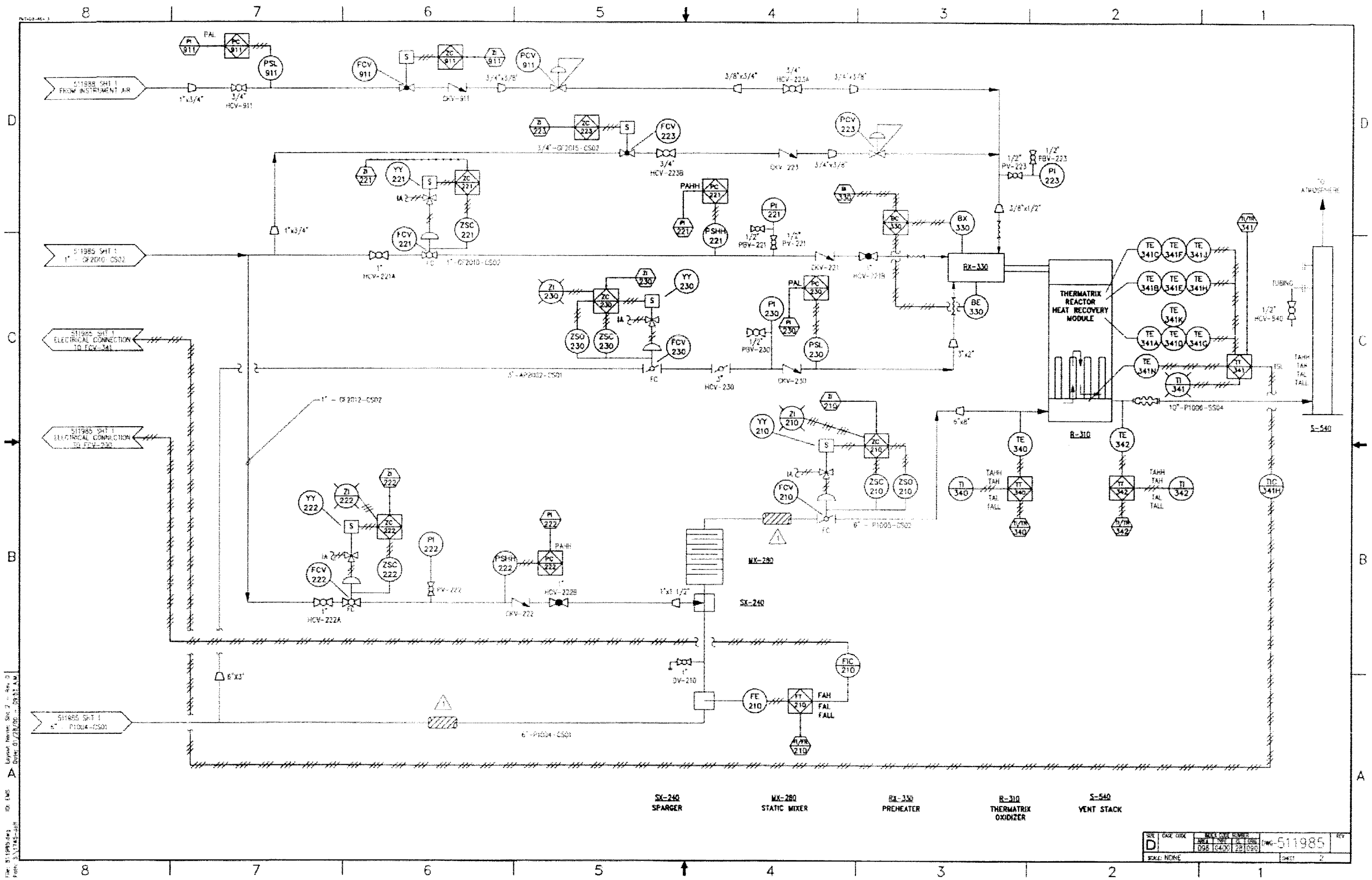
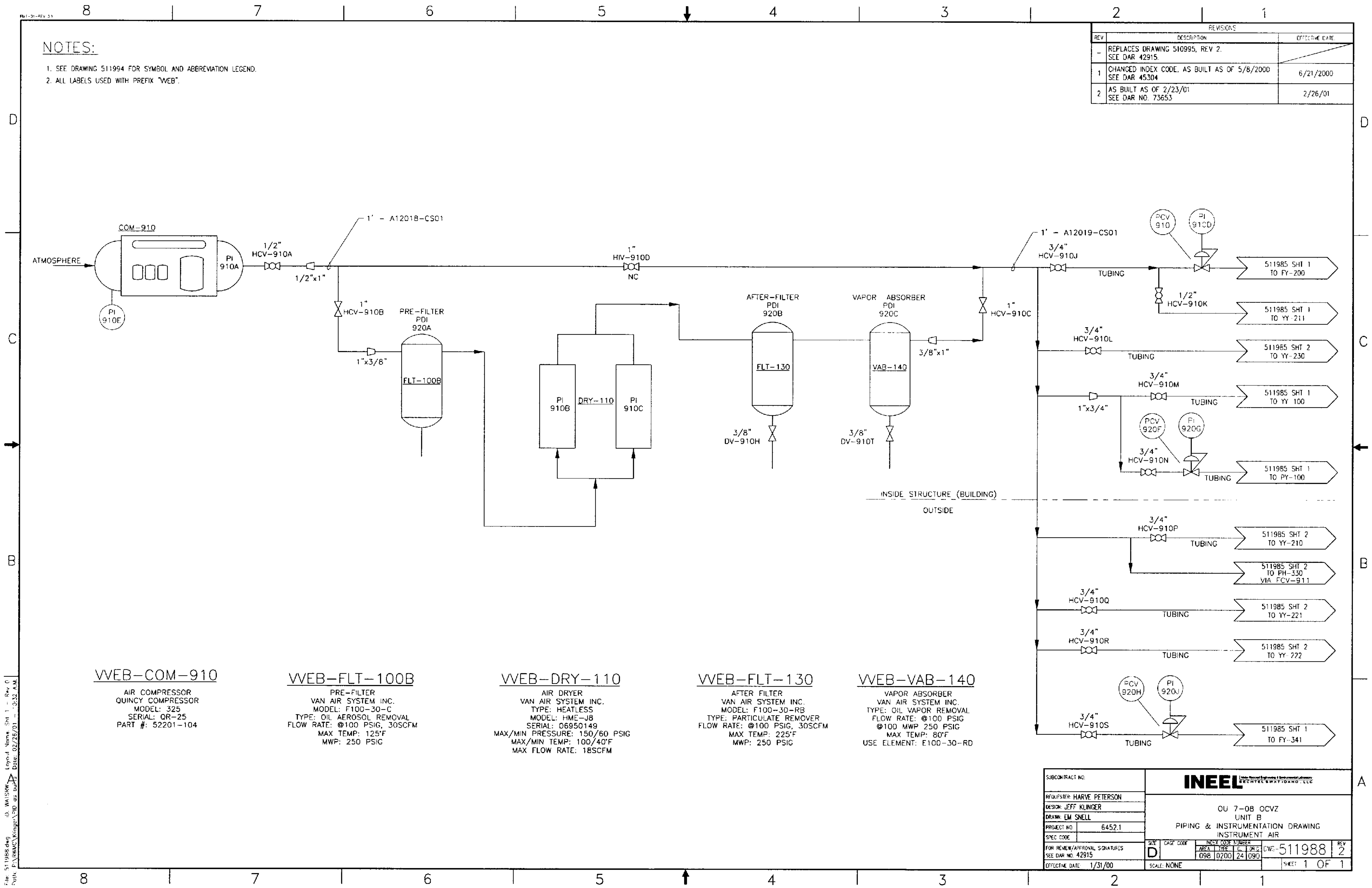
EFFECTIVE DATE 1/31/00
SCALE: NONE
SHEET 1 OF 2

VVET Unit B

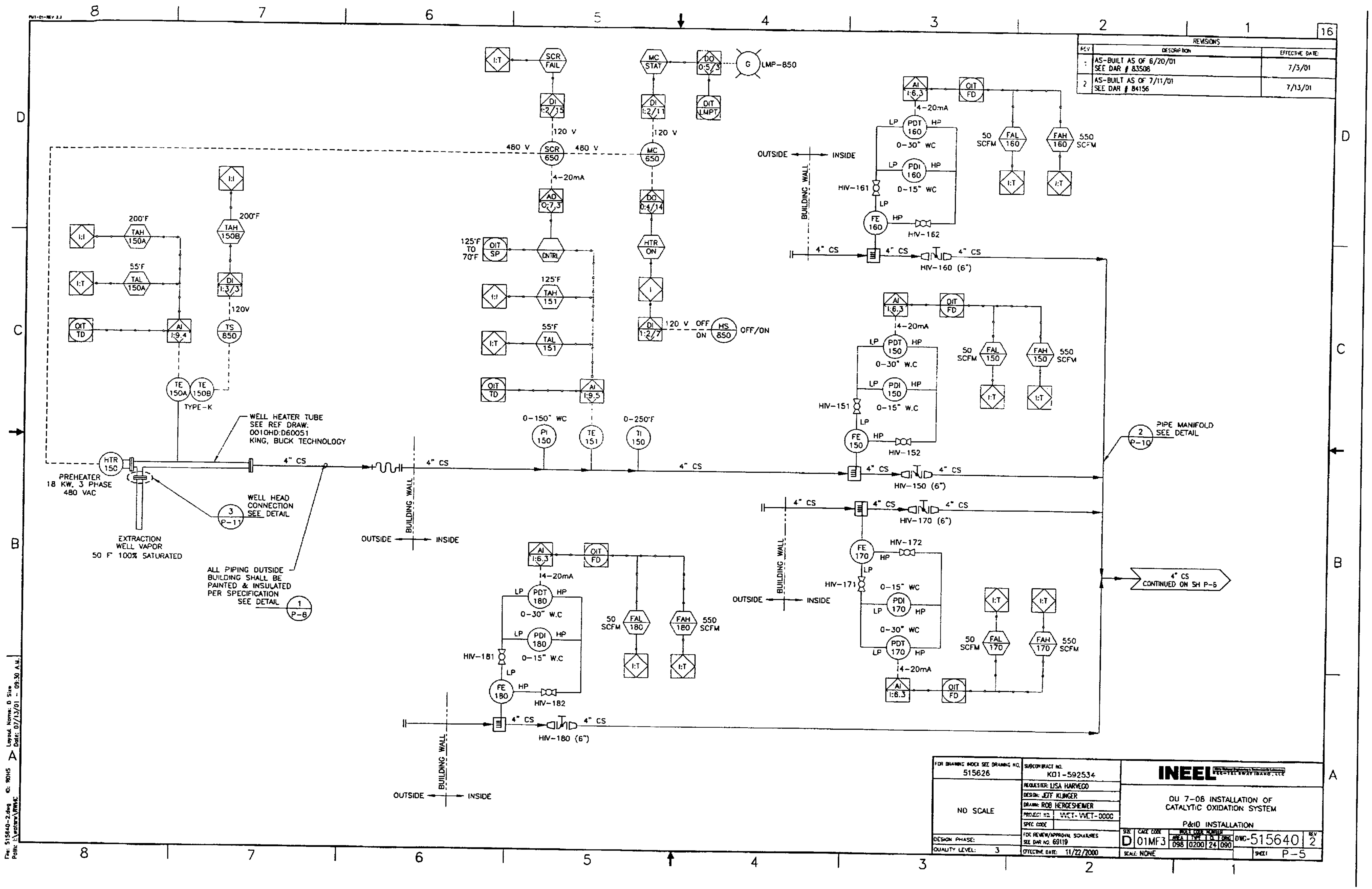

511985 SHT 1 FROM INSTRUMENT AIR
THERMATRIX REACTOR HEAT RECOVERY MODULE
R-310
S-540
SX-240
MX-280
RX-330
TO ATMOSPHERE
SX-240 SPARGER
MX-280 STATIC MIXER
RX-330 PREHEATER
R-310 THERMATRIX OXIDIZER
S-540 VENT STACK
511985

VVET Unit B



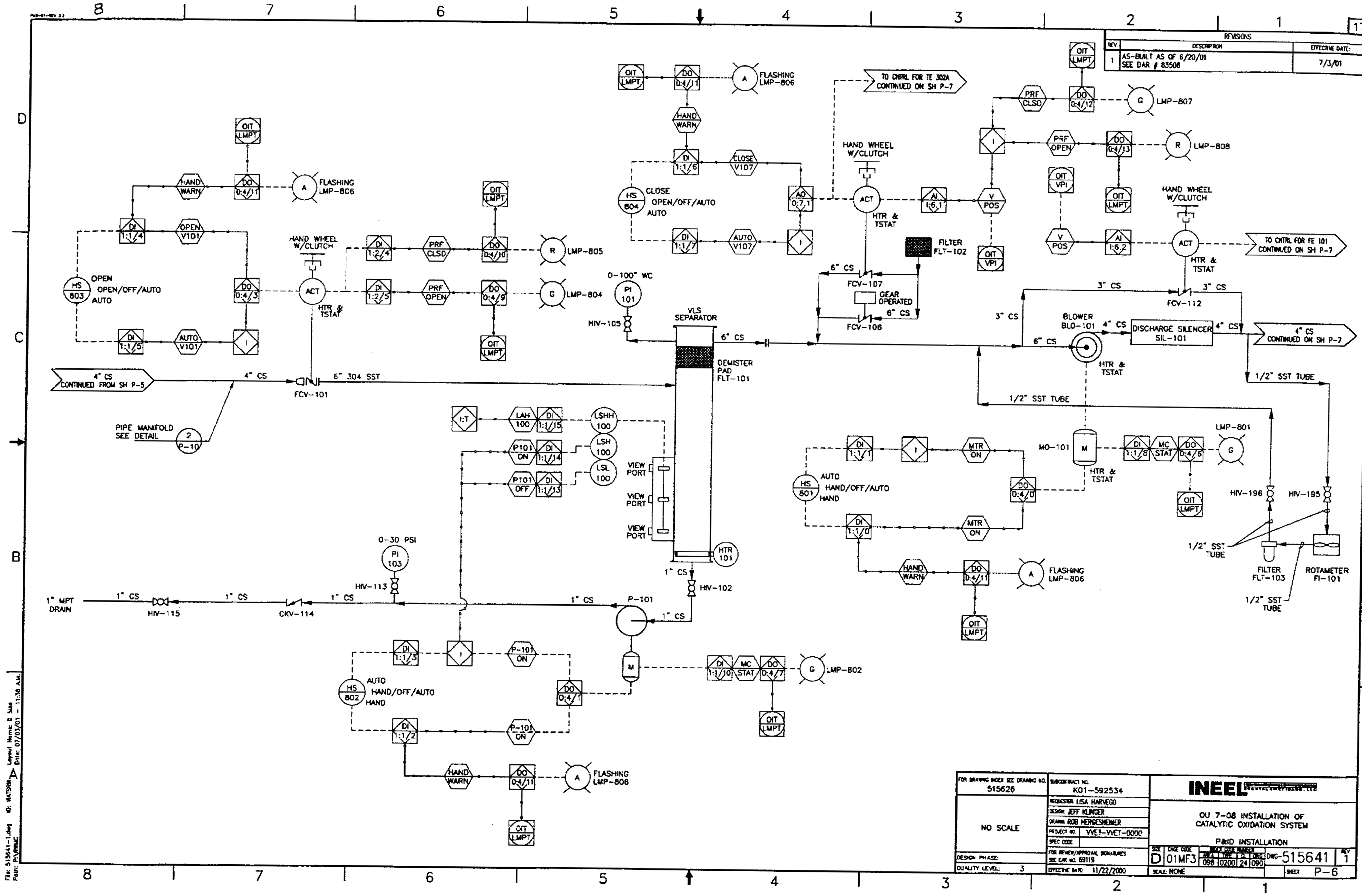
NOTES:
1. SEE DRAWING 511994 FOR SYMBOL AND ABBREVIATION LEGEND.
2. ALL LABELS USED WITH PREFIX "WEB".
REPLACES DRAWING 510995, REV 2. SEE DAR 42915
CHANGED INDEX CODE. AS BUILT AS OF 5/8/2000 SEE DAR 45304
6/21/2000
AS BUILT AS OF 2/23/01 SEE DAR NO. 73653
2/26/01
ATMOSPHERE
COM-910
INSIDE STRUCTURE (BUILDING)
OUTSIDE
VVEB-COM-910
AIR COMPRESSOR
QUINCY COMPRESSOR
MODEL: 325
SERIAL: OR-25
PART #: 52201-104
VVEB-FLT-100B
PRE-FILTER
VAN AIR SYSTEM INC.
MODEL: F100-30-C
TYPE: OIL AEROSOL REMOVAL
FLOW RATE: @100 PSIG, 30SCFM
MAX TEMP: 125°F
MWP: 250 PSIG
VVEB-DRY-110
AIR DRYER
VAN AIR SYSTEM INC.
TYPE: HEATLESS
MODEL: HME-J8
SERIAL: 06950149
MAX/MIN PRESSURE: 150/60 PSIG
MAX/MIN TEMP: 100/40°F
MAX FLOW RATE: 18SCFM
VVEB-FLT-130
AFTER FILTER
VAN AIR SYSTEM INC.
MODEL: F100-30-RB
TYPE: PARTICULATE REMOVER
FLOW RATE: @100 PSIG, 30SCFM
MAX TEMP: 225°F
MWP: 250 PSIG
VVEB-VAB-140
VAPOR ABSORBER
VAN AIR SYSTEM INC.
TYPE: OIL VAPOR REMOVAL
FLOW RATE: @100 PSIG
@100 MWP 250 PSIG
MAX TEMP: 80°F
USE ELEMENT: E100-30-RD
INEEL
REQUESTER HARVE PETERSON
DESIGN JEFF KLINGER
DRAWN EM SNELL
PROJECT NO. 6452.1
SEE DAR NO. 42915
EFFECTIVE DATE 1/31/00
OU 7-08 OCVZ
UNIT B
PIPING & INSTRUMENTATION DRAWING
INSTRUMENT AIR
511988
SCALE: NONE
SHEET 1 OF 1

VVET Unit D



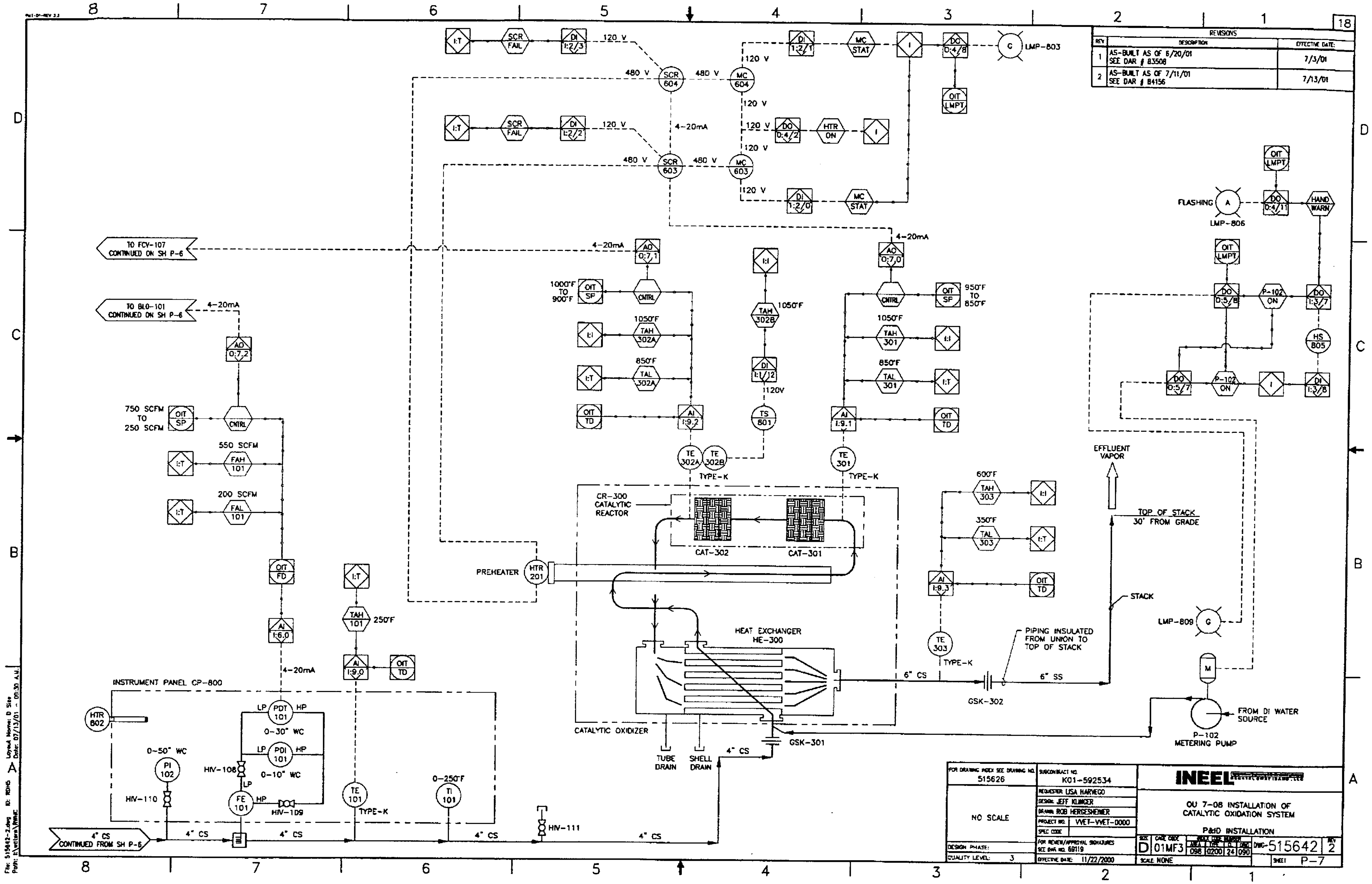
REVISIONS
AS-BUILT AS OF 6/20/01 SEE DAR # 83508 7/3/01
AS-BUILT AS OF 7/11/01 SEE DAR # 84156 7/13/01
PREHEATER 18 KW, 3 PHASE 480 VAC
EXTRACTION WELL VAPOR 50 F 100% SATURATED
WELL HEATER TUBE SEE REF DRAW. 0010HD:D60051 KING, BUCK TECHNOLOGY
WELL HEAD CONNECTION SEE DETAIL
ALL PIPING OUTSIDE BUILDING SHALL BE PAINTED & INSULATED PER SPECIFICATION SEE DETAIL
BUILDING WALL
OUTSIDE
INSIDE
PIPE MANIFOLD SEE DETAIL
4" CS CONTINUED ON SH P-5
HIV-150 (6")
HIV-160 (6")
HIV-170 (6")
HIV-180 (6")
LMP-850
OFF/ON
515626
K01-592534
REQUESTER: LISA HARVEGO
DESIGN: JEFF KLINGER
DRAWN: ROB HERGESHEIMER
NO SCALE
INEEL
OU 7-08 INSTALLATION OF CATALYTIC OXIDATION SYSTEM
P&ID INSTALLATION
11/22/2000
515640
P-5

VVET Unit D



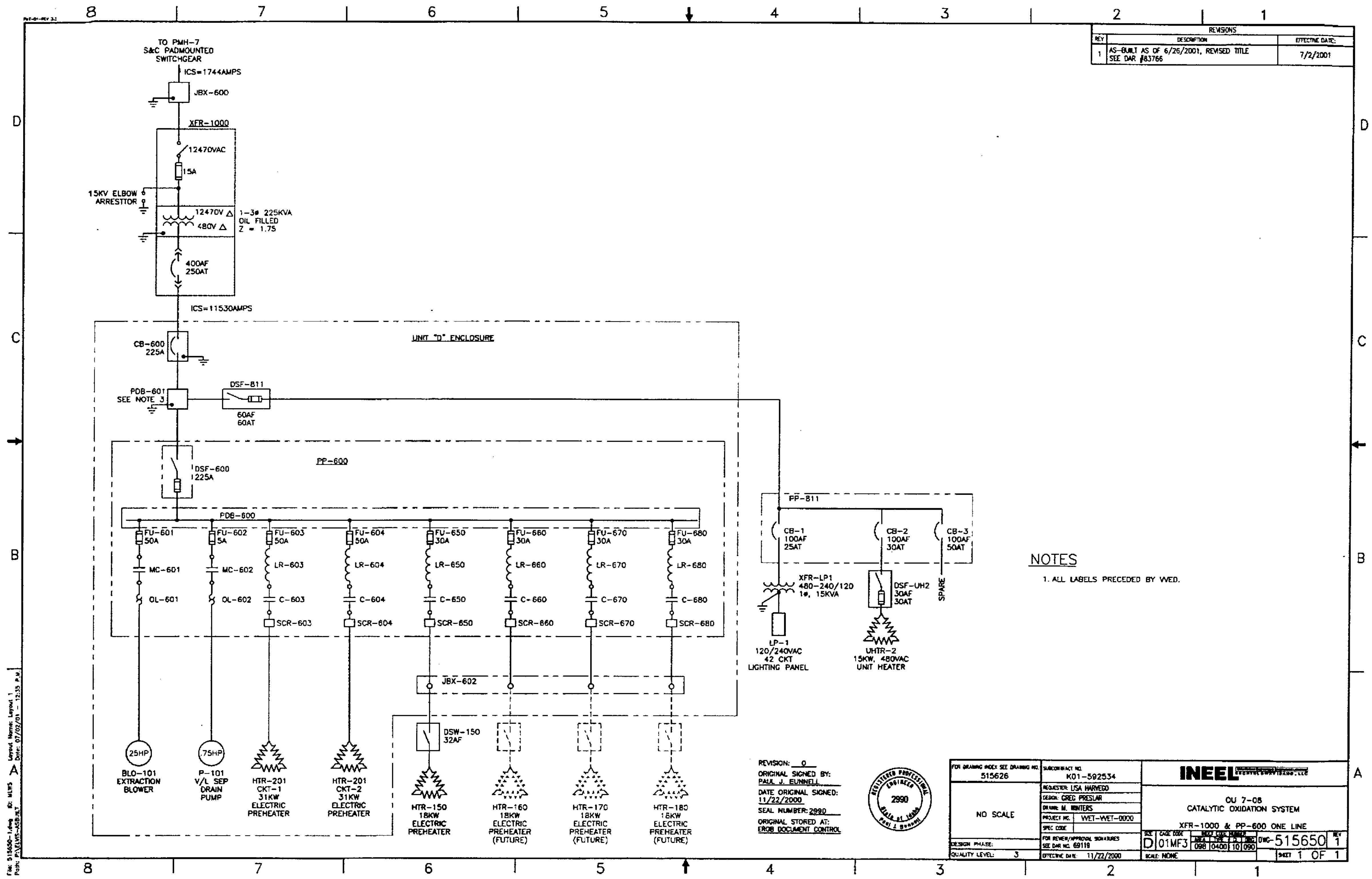
OU 7-08 INSTALLATION OF
CATALYTIC OXIDATION SYSTEM
P&ID INSTALLATION
INEEL
515626
K01-592534
NO SCALE
DWG-515641
P-6
VLS SEPARATOR
DEMISTER PAD FLT-101
BLOWER BLO-101
DISCHARGE SILENCER SIL-101
FILTER FLT-102
FCV-101
FCV-106
FCV-107
FCV-112
P-101
HIV-105
HIV-102
HIV-113
HIV-115
CKV-114
HIV-195
HIV-196
FILTER FLT-103
ROTAMETER FI-101
MO-101
4" CS CONTINUED FROM SH P-5
4" CS CONTINUED ON SH P-7
TO CNTRL FOR TE 302A CONTINUED ON SH P-7
TO CNTRL FOR FE 101 CONTINUED ON SH P-7
PIPE MANIFOLD SEE DETAIL
1" MPT DRAIN
AS-BUILT AS OF 6/20/01 SEE DAR # 83506
7/3/01

VVET Unit D



REVISIONS
AS-BUILT AS OF 6/20/01 SEE DAR # 83508 7/3/01
AS-BUILT AS OF 7/11/01 SEE DAR # 84156 7/13/01
TO FCV-107 CONTINUED ON SH P-6
TO BLO-101 CONTINUED ON SH P-6
4" CS CONTINUED FROM SH P-5
INSTRUMENT PANEL CP-800
PREHEATER
CR-300 CATALYTIC REACTOR
CAT-302
CAT-301
HEAT EXCHANGER HE-300
CATALYTIC OXIDIZER
TUBE DRAIN
SHELL DRAIN
GSK-301
GSK-302
PIPING INSULATED FROM UNION TO TOP OF STACK
STACK
TOP OF STACK 30' FROM GRADE
EFFLUENT VAPOR
FROM DI WATER SOURCE
P-102 METERING PUMP
FLASHING
LMP-806
LMP-809
LMP-803
750 SCFM TO 250 SCFM
550 SCFM
200 SCFM
1000°F TO 900°F
950°F TO 850°F
1050°F
850°F
600°F
350°F
250°F
0-50" WC
0-30" WC
0-10" WC
0-250°F
4-20mA
120 V
480 V
TYPE-K
6" CS
6" SS
4" CS
HIV-108
HIV-109
HIV-110
HIV-111
515626
K01-592534
NO SCALE
INEEL
OU 7-08 INSTALLATION OF CATALYTIC OXIDATION SYSTEM
P&ID INSTALLATION
D 01MF3
515642
P-7

VVET Unit D



TO PMH-7 S&C PADMOUNTED SWITCHGEAR
ICS=1744AMPS
JBX-600
XFR-1000
12470VAC
15A
15KV ELBOW ARRESTOR
12470V Δ 480V Δ
1-3ø 225KVA OIL FILLED Z = 1.75
400AF 250AT
ICS=11530AMPS
UNIT "D" ENCLOSURE
CB-600 225A
PDB-601 SEE NOTE 3
DSF-811
60AF 60AT
PP-600
DSF-600 225A
PDB-600
FU-601 50A
FU-602 5A
FU-603 50A
FU-604 50A
FU-650 30A
FU-660 30A
FU-670 30A
FU-680 30A
MC-601
MC-602
LR-603
LR-604
LR-650
LR-660
LR-670
LR-680
OL-601
OL-602
C-603
C-604
C-650
C-660
C-670
C-680
SCR-603
SCR-604
SCR-650
SCR-660
SCR-670
SCR-680
JBX-602
DSW-150 32AF
25HP
BLO-101 EXTRACTION BLOWER
75HP
P-101 V/L SEP DRAIN PUMP
HTR-201 CKT-1 31KW ELECTRIC PREHEATER
HTR-201 CKT-2 31KW ELECTRIC PREHEATER
HTR-150 18KW ELECTRIC PREHEATER
HTR-160 18KW ELECTRIC PREHEATER (FUTURE)
HTR-170 18KW ELECTRIC PREHEATER (FUTURE)
HTR-180 18KW ELECTRIC PREHEATER (FUTURE)
PP-811
CB-1 100AF 25AT
CB-2 100AF 30AT
CB-3 100AF 50AT
XFR-LP1 480-240/120 1ø, 15KVA
DSF-UH2 30AF 30AT
SPARE
LP-1 120/240VAC 42 CKT LIGHTING PANEL
UHTR-2 15KW, 480VAC UNIT HEATER
NOTES
1. ALL LABELS PRECEDED BY VVED.
REVISIONS
REV | DESCRIPTION | EFFECTIVE DATE
1 | AS-BUILT AS OF 6/26/2001, REVISED TITLE SEE DAR #83766 | 7/2/2001
REVISION: 0
ORIGINAL SIGNED BY: PAUL J. EUNNELL
DATE ORIGINAL SIGNED: 11/22/2000
SEAL NUMBER: 2990
ORIGINAL STORED AT: EROB DOCUMENT CONTROL
2990
515626
NO SCALE
K01-592534
USA HARVEGO
GREG PRESLAR
M. WINTERS
WET-WET-0000
69119
11/22/2000
QUALITY LEVEL: 3
INEEL
OU 7-08
CATALYTIC OXIDATION SYSTEM
XFR-1000 & PP-600 ONE LINE
D 01MF3 098 0400 10 090
DWG-515650
SHEET 1 OF 1
SCALE: NONE